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Report on the individual review of the annual submission of Portugal submitted in 2014*

* In the symbol for this document, 2014 refers to the year in which the inventory was submitted, and not to the year of publication.

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I. Introduction and summary

1. This report covers the review of the 2014 annual submission of Portugal, coordinated by the UNFCCC secretariat, in accordance with the "Guidelines for review under Article 8 of the Kyoto Protocol" (decision 22/CMP.1) (hereinafter referred to as the Article 8 review guidelines). The review took place from 15 to 20 September 2014 in Bonn, Germany, and was conducted by the following team of nominated experts from the UNFCCC roster of experts: generalists – Mr. Newton Paciornik (Brazil) and Ms. Melissa Weitz (United States of America); energy – Mr. Leonidas Girardin (Argentina), Ms. Gherghita Nicodim (Romania) and Mr. Anand Sookun (Mauritius); industrial processes and solvent and other product use – Mr. Erhan Unal (Turkey) and Ms. Sina Wartmann (Germany); agriculture – Mr. Paul Duffy (Ireland), Mr. Bernard Hyde (Ireland) and Mr. Yuriy Pyrozhenko (Ukraine); land use, land-use change and forestry (LULUCF) – Mr. Valentin Bellassen (France), Mr. Zoltan Somogyi (Hungary) and Ms. Diana Vargas (Colombia); and waste – Ms. Maryna Bereznytska (Ukraine) and Ms. Riitta Pipatti (Finland). Ms. Bereznytska and Mr. Paciornik were the lead reviewers. The review was coordinated by Mr. Roman Payo (UNFCCC secretariat).

2. In accordance with the Article 8 review guidelines, a draft version of this report was sent to the Government of Portugal, which provided comments that were considered and incorporated, as appropriate, into this final version of the report. All encouragements and recommendations in this report are for the next annual submission, unless otherwise specified. The expert review team (ERT) notes that the 2013 annual review report of Portugal was published after 15 April 2014, which may have affected the Party's ability to implement recommendations and encouragements made in the previous review report.

3. All recommendations and encouragements included in this report are based on the ERT's assessment of the 2014 annual submission against the Article 8 review guidelines. The ERT has not taken into account the fact that Parties will prepare the submissions due by 15 April 2015 using the revised "Guidelines for the preparation of national communications by Parties include in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual greenhouse gas inventories" adopted through decision 24/CP.19. Therefore, when preparing the next annual submissions, Parties should evaluate the implementation of the recommendations and encouragements in this report, in the context of those guidelines.

4. In 2012, the main greenhouse gas (GHG) emitted by Portugal was carbon dioxide (CO_2), accounting for 73.2 per cent of total GHG emissions[1] expressed in carbon dioxide equivalent (CO_2 eq), followed by methane (CH_4) (17.8 per cent) and nitrous oxide (N_2O) (6.5 per cent). Hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF_6) collectively accounted for 2.5 per cent of the overall GHG emissions in the country. The energy sector accounted for 69.6 per cent of total GHG emissions, followed by the waste sector (11.9 per cent), the agriculture sector (10.5 per cent), the industrial processes sector (7.7 per cent) and the solvent and other product use sector (0.3 per cent). Total GHG emissions amounted to 68,853.77 Gg CO_2 eq and increased by 13.1 per cent between the base year[2] and 2012. The ERT concluded that the description in the

[1] In this report, the term "total GHG emissions" refers to the aggregated national GHG emissions expressed in terms of carbon dioxide equivalent excluding LULUCF, unless otherwise specified.

[2] "Base year" refers to the base year under the Kyoto Protocol, which is 1990 for CO_2, CH_4 and N_2O, and 1995 for HFCs, PFCs and SF_6. The base year emissions include emissions from source categories included in Annex A to the Kyoto Protocol only.

national inventory report (NIR) of the trends for the different gases and sectors is reasonable.

5. Tables 1 and 2 show GHG emissions from source categories included in Annex A to the Kyoto Protocol (hereinafter referred to as Annex A sources), emissions and removals from the LULUCF sector under the Convention and emissions and removals from activities under Article 3, paragraph 3, and, if any, elected activities under Article 3, paragraph 4, of the Kyoto Protocol (KP-LULUCF), by gas and by sector and activity, respectively.

6. Information to be included in the compilation and accounting database can be found in annex I to this report.

II. Technical assessment of the annual submission

A. Overview

1. Annual submission and other sources of information

7. The 2014 annual submission was submitted on 15 April 2014; it contains a complete set of common reporting format (CRF) tables for the period 1990–2012 and an NIR. Portugal further submitted revised CRF tables and a revised NIR on 26 May 2014. Portugal also submitted the information required under Article 7, paragraph 1, of the Kyoto Protocol, including information on: activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, accounting of Kyoto Protocol units, changes in the national system and in the national registry and the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol. The standard electronic format (SEF) tables were submitted on 15 April 2014. The annual submission was submitted in accordance with decision 15/CMP.1.

8. Portugal submitted revised emission estimates on 20 November 2014 in response to the list of potential problems and further questions raised by the ERT. The values used in this report are those submitted by Portugal on 20 November 2014.

9. The list of other materials used during the review is provided in annex II to this report.

2. Questions of implementation raised in the 2013 annual review report

10. The ERT noted that no questions of implementation have been raised in the 2013 annual review report.

Table 1

Greenhouse gas emissions from Annex A sources and emissions/removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol by gas, base year[a] to 2012

			Gg CO_2 eq								*Change (%)*
		Greenhouse gas	*Base year*	*1990*	*1995*	*2008*	*2009*	*2010*	*2011*	*2012*	*Base year–2012*
Annex A sources[b]		CO_2	45 104.53	45 104.53	54 448.94	59 907.29	57 115.78	52 588.11	51 243.10	50 411.76	11.8
		CH_4	10 206.39	10 206.39	11 359.25	12 025.85	11 809.30	11 926.87	12 116.40	12 250.29	20.0
		N_2O	5 551.46	5 551.46	5 663.61	5 065.08	4 749.34	4 808.15	4 512.52	4 479.17	–19.3
		HFCs	26.54	NA, NE, NO	26.54	1 115.20	1 236.72	1 367.81	1 492.90	1 667.32	6 182.9
		PFCs	NA, NO	NA, NE, NO	NA, NO	0.15	0.01	0.0009	NA, NO	NA, NO	NA
		SF_6	6.83	NA, NE, NO	6.83	35.63	40.89	43.57	43.64	45.23	562.5
KP-LULUCF	Article 3.3[c]	CO_2				–3 484.89	–3 417.82	–3 032.80	–3 121.48	–2 663.80	
		CH_4				5.19	22.43	42.40	21.14	44.46	
		N_2O				54.62	145.55	192.38	138.26	170.62	
	Article 3.4[d]	CO_2	4 770.47			–9 057.75	–9 488.44	–8 426.19	–10 039.56	–7 697.82	NA
		CH_4	15.37			15.08	40.25	108.93	42.47	133.88	NA
		N_2O	351.10			31.75	44.59	67.39	53.24	80.38	NA

Abbreviations: Annex A sources = source categories included in Annex A to the Kyoto Protocol, KP-LULUCF = land use, land-use change and forestry emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, NA = not applicable, NE = not estimated, NO = not occurring.

[a] The base year for Annex A sources refers to the base year under the Kyoto Protocol, which is 1990 for CO_2, CH_4 and N_2O, and 1995 for HFCs, PFCs and SF_6. The base year for cropland management, grazing land management and revegetation under Article 3, paragraph 4, of the Kyoto Protocol is 1990. For activities under Article 3, paragraph 3, of the Kyoto Protocol and forest management under Article 3, paragraph 4, only the inventory years of the commitment period must be reported.

[b] CO_2, CH_4 and N_2O emissions included in the rows under Annex A sources do not include the emissions from deforestation that were included in Portugal's initial report under the Kyoto Protocol for the base year and subsequently used for the calculation of the assigned amount.

[c] Activities under Article 3, paragraph 3, of the Kyoto Protocol, namely afforestation and reforestation, and deforestation.

[d] Elected activities under Article 3, paragraph 4, of the Kyoto Protocol, including forest management, cropland management, grazing land management and revegetation.

Table 2
Greenhouse gas emissions by sector and activity, base year[a] to 2012

			Gg CO_2 eq							*Change (%)*
	Sector	*Base year*	*1990*	*1995*	*2008*	*2009*	*2010*	*2011*	*2012*	*Base year–2012*
Annex A sources	Energy	41 505.65	41 505.65	50 639.40	55 341.93	54 241.76	49 231.10	48 372.84	47 896.94	15.4
	Industrial processes	4 962.63	4 929.27	5 348.51	7 409.60	5 782.33	6 029.22	5 291.25	5 314.93	7.1
	Solvent and other product use	317.27	317.27	281.10	268.41	252.47	253.25	245.09	232.71	–26.7
	Agriculture	8 118.59	8 118.59	8 174.52	7 500.64	7 359.22	7 337.02	7 240.63	7 223.81	–11.0
	Waste	5 991.60	5 991.60	7 061.64	7 628.62	7 316.28	7 883.91	8 258.75	8 185.37	36.6
	LULUCF	NA	58.01	–5 315.73	–14 333.27	–14 224.16	–12 439.74	–13 909.70	–10 647.91	NA
	Total (with LULUCF)	**NA**	**60 920.39**	**66 189.44**	**63 815.93**	**60 727.89**	**58 294.76**	**55 498.86**	**58 205.87**	**NA**
	Total (without LULUCF)	**60 895.75**	**60 862.38**	**71 505.17**	**78 149.20**	**74 952.05**	**70 734.50**	**69 408.56**	**68 853.77**	**13.1**
	Other[b]	NA	NA	NA	NA	NA	NA	NA	NA	NA
KP-LULUCF	Article 3.3[c] Afforestation and reforestation				–5 294.51	–5 274.20	–4 884.79	–5 003.32	–4 534.82	
	Article 3.3[c] Deforestation				1 869.43	2 024.36	2 086.77	2 041.24	2 086.11	
	Total (3.3)				**–3 425.09**	**–3 249.83**	**–2 798.03**	**–2 962.08**	**–2 448.71**	
	Article 3.4[d] Forest management				–9 544.03	–9 902.55	–8 676.08	–10 312.76	–7 852.79	
	Article 3.4[d] Cropland management	3 687.11			268.53	273.56	255.72	270.51	295.71	NA
	Article 3.4[d] Grazing land management	1 449.84			264.57	225.39	170.49	98.41	73.53	NA
	Article 3.4[d] Revegetation	NA			NA	NA	NA	NA	NA	NA
	Total (3.4)	**5 136.95**			**–9 010.92**	**–9 403.60**	**–8 249.87**	**–9 943.84**	**–7 483.56**	**NA**

Abbreviations: Annex A sources = source categories included in Annex A to the Kyoto Protocol, KP-LULUCF = LULUCF emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, LULUCF = land use, land-use change and forestry, NA = not applicable.

[a] The base year for Annex A sources is the base year under the Kyoto Protocol, which is 1990 for CO_2, CH_4 and N_2O, and 1995 for HFCs, PFCs and SF_6. The base year for cropland management, grazing land management and revegetation under Article 3, paragraph 4, of the Kyoto Protocol is 1990. For activities under Article 3, paragraph 3, of the Kyoto Protocol and forest management under Article 3, paragraph 4, only the inventory years of the commitment period must be reported.

[b] Emissions/removals reported in the sector other (sector 7) are not included in Annex A to the Kyoto Protocol and are therefore not included in national totals.

[c] Activities under Article 3, paragraph 3, of the Kyoto Protocol, namely afforestation and reforestation, and deforestation.

[d] Elected activities under Article 3, paragraph 4, of the Kyoto Protocol, including forest management, cropland management, grazing land management and revegetation.

3. Overall assessment of the inventory

11. Table 3 contains the ERT's overall assessment of the annual submission of Portugal. For recommendations for improvements for specific categories, please see the paragraphs cross-referenced in the table.

Table 3
The expert review team's overall assessment of the annual submission

Issue	*Expert review team assessment*	*General findings and recommendations*
The ERT's findings on completeness		
Annex A sources[a]	Complete	Mandatory: none Non-mandatory: CH_4 emissions from agricultural soils are reported as "NE". The ERT encourages Portugal to estimate and report these emissions
Land use, land-use change and forestry[a]	Complete	Mandatory: none Non-mandatory: none
KP-LULUCF	Complete	
The ERT's findings on recalculations and time-series consistency		
Transparency of recalculations	Sufficiently transparent	Please see paragraph 48 below for category-specific findings
Time-series consistency	Sufficiently consistent	Please see paragraphs 55, 57, 58, 102 and 103 below for category-specific findings
The ERT's findings on QA/QC procedures	Sufficient	Portugal has elaborated a QA/QC plan and has implemented tier 1 QA/QC procedures in accordance with that plan (see para. 12) The ERT recommends that Portugal implement additional QC procedures to avoid errors and discrepancies between the CRF tables and the NIR (see paras. 29, 38, 39, 66, 69, 70 and 90 below)
The ERT's findings on transparency	Sufficiently transparent except for the LULUCF sector	The ERT commends Portugal for the increased transparency of the 2014 submission, particularly for the energy and agriculture sectors. However, there is still room for increasing the transparency of the NIR, particularly for the LULUCF and waste sectors. Please see paragraphs 28, 30, 31, 36, 53, 59, 60, 66, 74, 75, 96, 97 and 101 below for category-specific recommendations

Abbreviations: Annex A sources = source categories included in Annex A to the Kyoto Protocol, CRF = common reporting format, ERT = expert review team, KP-LULUCF = LULUCF emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, LULUCF = land use, land-use change and forestry, NE = not estimated, NIR = national inventory report, QA/QC = quality assurance/quality control.

[a] The assessment of completeness by the ERT considers only the completeness of reporting of mandatory categories (i.e. categories for which methods and default emission factors are provided in the Intergovernmental Panel on Climate Change (IPCC) *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*, the IPCC *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* or the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry*).

12. Portugal developed its quality assurance/quality control (QA/QC) plan and started its implementation for the 2012 annual submission. For the 2014 submission, a research project was introduced, which focused on, among other tasks, the application of QC procedures to the 2014 inventory for all sectors, but most of the information was not included in the NIR. In response to a question raised by the ERT during the review, Portugal provided the results of the research project for QC activities. The ERT recommends that Portugal provide information on the QC activities and their results.

4. Description of the institutional arrangements for inventory preparation, including the legal and procedural arrangements for inventory planning, preparation and management

Inventory planning

13. The NIR and additional information provided by Portugal during the review described the national system for the preparation of the inventory. There were changes to the national system for the 2014 annual submission, as identified by the Party in chapter 12 of its NIR (see also para. 130 below). As also indicated by Portugal in its NIR there were no changes to the inventory planning process. The description of the inventory planning process, as contained in the report of the individual review of the annual submission of Portugal submitted in 2013,[3] remains relevant.

14. In response to recommendations included in previous review reports, Portugal improved the description of the arrangements for inventory planning and preparation by providing more information related to the interaction between responsible institutions and the process of approval of the inventory. In response to questions raised by the ERT during the review, Portugal provided its current methodological development plan, developed by the Portuguese Environmental Agency (APA)[4] in cooperation with the sectoral focal points to institute planned improvements and responses to review recommendations. The ERT reiterates the encouragement to Portugal to describe in more detail the methodological development plan in the NIR, highlighting its prioritization schedule and sectoral improvement plans.

Inventory preparation

15. Table 4 contains the ERT's assessment of Portugal's inventory preparation process. For improvements related to specific categories, please see the paragraphs cross-referenced in the table.

Table 4
Assessment of inventory preparation by Portugal

Issue	*ERT assessment*	*ERT findings and recommendations*
Key category analysis		
Was the key category analysis performed in accordance with the IPCC good practice guidance and the IPCC good practice guidance for LULUCF?	No	See paragraph 16 below
Approach followed?	Tier 2	
Were additional key categories identified using a qualitative approach?	No	

[3] FCCC/ARR/2013/PRT, paragraph 9.
[4] *Agência Portuguesa do Ambiente*.

Issue	*ERT assessment*	*ERT findings and recommendations*
Has Portugal identified key categories for activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol following the guidance on establishing the relationship between the activities under the Kyoto Protocol and the associated key categories in the UNFCCC inventory?	Yes	The NIR describes the criteria for identifying the key categories, namely the comparison with the status of associated categories under the Convention. However, Portugal did not complete the column labelled "Comments" of KP-LULUCF table NIR-3, and the ERT encourages Portugal to complete it
Does Portugal use the key category analysis to prioritize inventory improvements?	Yes	
Assessment of uncertainty analysis		
Approach followed?	Tier 1	
Was the uncertainty analysis carried out in accordance with the IPCC good practice guidance and the IPCC good practice guidance for LULUCF?	Yes, methodologically	The methodology is in accordance with the IPCC good practice guidance and the IPCC good practice guidance for LULUCF. However, the uncertainty estimates for some categories are not reasonable and lead to very high uncertainties in sectors where the actual uncertainties are likely to be much lower (e.g. fuel combustion, the agriculture sector). The ERT reiterates the recommendation made in the 2012 review report that Portugal revise and update the uncertainty data for AD and EFs Please see paragraphs 67, 78 and 113 below for category-specific recommendations
Quantitative uncertainty (including LULUCF)	Level = 11.4–17.3% in the period 1990–2012 (NIR, page 1-23) (see para. 17 below) Trend = 13.4% (NIR, page 1-23)	
Quantitative uncertainty (excluding LULUCF)	Level: not reported Trend: not reported	

Abbreviations: AD = activity data, EF = emission factor, ERT = expert review team, IPCC good practice guidance = the Intergovernmental Panel on Climate Change (IPCC) *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*, IPCC good practice guidance for LULUCF = IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry*, LULUCF = land use, land-use change and forestry, NIR = national inventory report.

16. Portugal performed a key category analysis in a single step, for all categories (including the LULUCF sector). In accordance with the Intergovernmental Panel on Climate Change (IPCC) *Good Practice Guidance for Land Use, Land-Use Change and Forestry* (hereinafter referred to as the IPCC good practice guidance for LULUCF) (section 5.4.2, "Quantitative approaches to determining key categories"), a key category analysis with LULUCF should be developed in two steps. The key categories should first be identified for the inventory excluding the LULUCF sector, then the key category analysis should be repeated for the full inventory including the categories from the LULUCF sector. If some of the non-LULUCF categories that are identified as key in the first analysis do not appear as key when the LULUCF categories are included, these categories should still be considered as key. The ERT notes that Portugal's calculation may have failed to identify some non-LULUCF key categories. Therefore, the ERT recommends that Portugal identify key categories in accordance with the IPCG good practice guidance for LULUCF.

17. Portugal does not indicate the uncertainty for the level of emissions in 2012. Moreover, table B3 of annex B to the NIR does not include a row with the results of the analysis. The ERT recommends that Portugal improve the reporting of the results of the uncertainty analysis by providing in the NIR the level of uncertainty for the last reported year and showing the results of the analysis in the table in the annex.

Inventory management

18. There were no changes to the inventory management process carried out by Portugal for the 2014 annual submission, as indicated by Portugal in response to questions raised by the ERT during the review. The description of the inventory management process, as contained in the report of the individual review of the annual submission of Portugal submitted in 2013,[5] remains relevant. The ERT reiterates the recommendation made in previous review reports that Portugal improve its archiving system by providing further description on the record-keeping and archiving procedures.

5. Follow-up to previous reviews

19. Portugal has improved its reporting on inventory improvements in response to recommendations made in previous review reports (NIR, section 9.1), including providing cross-references to the sectoral sections of the NIR where revisions have been implemented. The ERT commends Portugal for this improvement. The ERT recognizes that the 2013 review report was published after the due date for the submission of the 2014 annual submission (see para. 2 above), which may have affected the Party's ability to implement the recommendations made in the previous review report. However, many reiterated recommendations from previous review reports remain to be implemented. The ERT reiterates the recommendation made in the previous review report that Portugal implement all recommendations made in previous review reports.

20. Recommendations made in previous review reports that have not yet been implemented, as well as issues the ERT identified during the 2014 annual review, are discussed in the relevant sectoral chapters of the report and in table 9 below.

B. Energy

1. Sector overview

21. The energy sector is the main sector in the GHG inventory of Portugal. In 2012, emissions from the energy sector amounted to 47,896.94 Gg CO_2 eq, or 69.6 per cent of

[5] FCCC/ARR/2013/PRT, paragraph 11.

total GHG emissions. Since 1990, emissions have increased by 15.4 per cent. The key drivers for the rise in emissions are economic growth and higher energy demand, particularly the strong development of road infrastructure and rapid growth in private motor vehicle ownership. Private motor vehicle ownership contributed most to the 61.8 per cent increase in emissions from transport since 1990. Emissions from energy industries increased 6.3 per cent from 1990 to 2012. Emissions from energy industries in 2012 were 6.7 per cent higher than in 1990. There was a steady increase in emissions from 1990 to 2005 owing to economic growth; however, since 2005, reduced economic activity, fuel switching, cogeneration and increased renewable energy have reduced the growth in emissions from energy industries. There are inter-annual variations in emissions related to electricity generation because of the reliance on hydroelectricity. Within the sector, 36.4 per cent of the emissions were from energy industries, followed by 35.5 per cent from transport, 15.7 per cent from manufacturing industries and construction, 9.4 per cent from other sectors and 2.9 per cent from fugitive emissions from fuels. The remaining 0.1 per cent was from other (fuel combustion).

22. Portugal has made recalculations between the 2013 and 2014 annual submissions for this sector. The three most significant recalculations were in energy industries (emissions decreased by 0.2 per cent for 2011; no impact for 1990) manufacturing industries and construction (emissions decreased by 1.4 per cent and 1.6 per cent for 1990 and 2011, respectively) and fugitive emissions from oil and natural gas (emissions increased by 0.3 per cent for 1990 but decreased by 6.8 per cent for 2011). The recalculations were made following revisions in activity data (AD) for fuel consumption, owing to a revision to the energy balance made by the General Directorate for Energy and Geology (DGEG),[6] and the correction of errors. Portugal also recalculated the emissions from coal mining and handling for the period 1990–1994 (the two mines in the country are now considered underground mines) and Portugal started to estimate post-mining emissions from 1995 onwards. Compared with the 2013 annual submission, the recalculations decreased emissions in the energy sector for 2011 by 237.66 Gg CO_2 eq (0.5 per cent) and decreased total national emissions by 0.3 per cent. The recalculations were adequately explained in the NIR (section 9).

23. The recommendations made in the 2012 review report have been taken into account and improvements are being implemented or are planned for the coming years as mentioned in the 2014 NIR (section 3.5.1, page 3-211; for recommendations made in the 2013 review report, see paras. 2 and 19 above). A separate section on recalculations is included in the 2014 submission of the NIR following the recommendations from previous review reports.

2. Reference and sectoral approaches

24. Table 5 provides a review of the information reported under the reference approach and the sectoral approach, as well as comparisons with other sources of international data. Issues identified in table 5 are more fully elaborated in paragraphs 25–31 below.

[6] *Direção-Geral de Energia e Geologia.*

Table 5
Review of reference and sectoral approaches

Issue	*Expert review team assessment*	*Paragraph cross-references*
Difference between the reference approach and the sectoral approach	Energy consumption: –8.13 PJ, –1.3% CO_2 emissions: –433.86 Gg CO_2, –0.9%	
Are differences between the reference approach and the sectoral approach adequately explained in the NIR and the CRF tables?	Yes	See paragraphs 25 and 27 below
Are differences with international statistics adequately explained?	Yes	See paragraphs 25 and 27 below
Is reporting of bunker fuels in accordance with the UNFCCC reporting guidelines?	Yes	See para. 27 below
Is reporting of feedstocks and non-energy use of fuels in accordance with the UNFCCC reporting guidelines?	Yes	See paragraphs. 28–31 below

Abbreviations: CRF = common reporting format, NIR = national inventory report, UNFCCC reporting guidelines = "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories".

Comparison of the reference approach with the sectoral approach and international statistics

25. The ERT noted that the overall difference in the estimates of CO_2 emissions between the sectoral and reference approaches is less than 2.0 per cent for 2012. In response to a question raised by the ERT during the review, Portugal explained the reasons for the differences and referred to its 2014 NIR submission. Moreover, Portugal also mentioned that specific net calorific values (NCVs) for large point sources (LPS) are not always considered in the energy balance and the proportion of feedstocks which is carbon stored in products are default values from the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the Revised 1996 IPCC Guidelines) and not specific to the national conditions. Portugal explained that it is still making efforts to further improve the split between domestic and international energy consumption for aviation and navigation in the energy balance. The ERT recommends that the Party improve the consistency between the energy balance and the data available for LPS, and the split between domestic and international energy consumption for aviation and navigation.

26. The energy balance provides all data as tonnes of oil equivalent (toe). Portugal has reported the consumption data in the reference approach in CRF table 1.A(b) in toe for all fuels and has reported the corresponding conversion factor for converting GJ/toe to TJ. For the sectoral approach, fuel consumption is reported in TJ, but the conversion from toe to TJ is not explained in the NIR (the NCV is provided in MJ/m^3 for natural gas and in GJ/kg for other fuels, and fuel consumption is provided in TJ). The ERT commends Portugal for using a direct conversion factor for natural gas. In response to a question raised by the ERT during the review, Portugal provided the conversion factor for toe to tonnes for the fuels liquefied petroleum gas (LPG), naphtha, bitumen, gas/diesel oil, residual fuel oil and petroleum coke. The ERT recommends that Portugal provide complete information related to the appropriate conversion factors.

International bunker fuels

27. For international aviation bunker fuels, Portugal has made efforts to use the methodology based on flight destination rather than on the country of registration of aircraft as the basis for the split in the energy balance. For maritime bunker fuels, the Party uses a bottom-up approach to determine the amount of fuel used. The NIR (section 3.2.1) reports that until 2006, the classification for international fuel used by DGEG was different from the one used in the national inventory. The classification used by DGEG was based on the flag of the aircraft rather than on the origin and destination of the flight. The ERT recommends that Portugal improve the estimation of international aviation bunkers. The international aviation energy consumption data from the International Energy Agency (IEA) differ to some extent from the DGEG fuel balance because of an error in reporting to IEA. The IEA data incorrectly include consumption from domestic aviation as international aviation. DGEG is making efforts to correct this reporting error in the IEA data. The ERT recommends that Portugal resolve this discrepancy.

Feedstocks and non-energy use of fuels

28. The ERT noted a recommendation made in the previous review report that Portugal estimate all CO_2 emissions associated with the non-energy use of fuels (CRF table 1.A(d)) and CO_2 stored in products of certain fuels (coal oils and tars (from coking coal), natural gas, gas/diesel oil and ethane). The ERT also noted that during the 2012 review, the Party had explained that residual fuel oil is used as feedstock in the ammonia production process and the corresponding CO_2 emissions are reported, but the ERT noted that it was not clear whether the quantity of fuel oil used had been deducted from the energy consumption to avoid double counting of emissions. In response to a question raised by the ERT during the current review, the Party explained that it had intended to revise and further develop the reporting of feedstocks and non-energy use of fuels for the 2014 submission for all processes and fuels (i.e. not just for ammonia production), but this objective was not achieved because of other inventory developments competing for resources and because this improvement requires a thorough analysis of the quantities reported as feedstock in the energy balance in collaboration with the Portuguese Energy Authority. The ERT noted that in the 2014 submission, Portugal has replaced the notation key "NE" (not estimated) in CRF table 1.A(d) with "NO" (not occurring) or "NA" (not applicable). The ERT recommends that the Party implement the planned revision and further development of its reporting of feedstocks and non-energy use of fuels and explain transparently the estimates and the notation keys reported in CRF table 1.A(d).

29. The ERT noted that for 2010–2012, LPG is reported in the CRF tables 1.A(b) and 1.A(d) as a feedstock, but in the NIR (chapter 3.6.2.4, "Carbon stored in products", page 3-213) this consumption is not mentioned. In response to a question raised by the ERT during the review, the Party explained that the NIR information has not been updated, and the CRF tables provide the correct information. The ERT recommends that Portugal correct this inconsistency.

30. The ERT noted that Portugal reports for 1990–2010 carbon stored in non-energy use of fuels for the fuel type "other non-specified" in CRF table 1.A(d) (for 2011 and 2012 it was reported as "NO"). To improve transparency, the ERT recommends that the Party specify the fuel.

31. The 2012 review report noted that Portugal provided revised estimates during the review for the CO_2 emissions resulting from the use of natural gas for hydrogen production at one refinery. However, this recalculation was not listed in the NIR of the 2013 annual submission as a recalculation, nor was it explained. In response to a question raised by the ERT during the current review, the Party stated that CO_2 emissions related to hydrogen production in refineries are reported as fugitive emissions from refining/storage of oil, and

that details could not be presented in the NIR because of confidentiality constraints as there is only one hydrogen production unit at one of the refineries in the country. The CO_2 emission factor (EF) is obtained by measuring the carbon content of the fuel considered (natural gas) and lies between 2.77 and 2.80 t CO_2/t natural gas. To improve transparency and accuracy, the ERT recommends that Portugal explain the estimation of emissions from this category.

3. Key categories

Stationary combustion: all fuels – CO_2, CH_4 and N_2O[7]

32. To estimate CO_2 emissions from public electricity and heat production, a bottom-up approach is used to collect the AD, which are subsequently compared with the relevant data in the energy balance. At the same time, the energy balance is compared with the IEA energy statistics as an additional QA/QC procedure. The observed differences in several activities are explained by the compilation errors reported by DGEG in the energy balance sent to IEA. The ERT commends Portugal for these QA/QC activities and encourages the Party to continue these efforts in cooperation with DGEG to eliminate the discrepancies contained in the energy balance compilation.

33. In the category public electricity and heat production the main fuels used are imported coal, natural gas and, for the small plants in island territories, liquids such as fuel oil and diesel oil. On a smaller scale, municipal solid waste (MSW) with energy recovery is used and recently, two new power plants using wood waste were commissioned (starting operation in 2008 and 2009). Since 2005, the Party has used the CO_2 EFs from the European Union Emissions Trading System (EU ETS) verified reports[8] for hard coal, fuel oil and natural gas, in line with a recommendation made in the 2012 review report.

34. In response to a question raised by the ERT during the review on the humidity content of MSW incineration with energy recovery reported under public electricity and heat production, Portugal explained that the analysis of the AD did not include the humidity content. To improve accuracy, the ERT recommends that the Party analyse and consider in the emission estimates the humidity content of the incinerated wastes to ensure that the corresponding emissions are not overestimated.

35. The ERT noted that Portugal has reallocated the CO_2 emissions from limestone used for desulphurization from the energy sector to the industrial processes sector (limestone and dolomite use) in response to a recommendation made in the 2012 review report. The ERT commends Portugal for this action and recommends that the Party move the methodological description in the NIR from the energy sector to the industrial processes sector.

36. The AD for the liquid and gaseous fuels combusted for energy purposes in the category petroleum refining are based on EU ETS verified reports from the only two petroleum refineries in operation between 2005 and 2012. The ERT noted a recommendation made in the 2012 review report that the Party use the most accurate CO_2 EFs to estimate CO_2 emissions from the combustion of refinery fuel, fuel oil, gas oil, natural gas, off gas and tail gas, and include estimates of CO_2 emissions from the fuels that have not previously been estimated by using plant-specific AD and the CO_2 EFs available in the EU ETS verified reports. Although the Party has improved the reporting in the

[7] CH_4 and N_2O emissions from this category are not key. However, since all issues related to this category are discussed as a whole, the individual gases are not assessed in separate sections.

[8] Commission decision 2007/589/EC establishing guidelines for the monitoring and reporting of greenhouse gas emissions pursuant to directive 2003/87/EC of the European Parliament and of the Council.

category petroleum refining in the 2014 annual submission, the ERT considered that some aspects of the estimations are not completely clear, including: the CO_2 EFs used for the various types of fuel that are combusted in refineries; the sources of the AD for combusted fuels, particularly for the secondary gases; and how the Party avoided double counting of the estimates of fugitive emissions, given that some of these fuels could possibly be by-products of the refinery processes. In response to questions raised by the ERT during the review, Portugal stated that the plant-specific CO_2 EFs and AD cannot be published because of confidentiality considerations and that their use in the emission estimates is fully consistent with EU ETS data for the period 2005–2012. The Party also explained that there is no double counting in the fuel combustion data and the associated CO_2 emissions reported under petroleum refining and the fuel used in flares, fluid catalytic cracking, catalyst regeneration or hydrogen production activities because all non-combustion emissions from refineries are reported under the fugitive emissions category. The ERT commends the Party for the actions taken following the recommendations made in the 2012 review report to improve the accuracy and transparency of the estimations in this category and recommends that the Party include the information provided during the current review in its NIR.

37. For the category manufacturing industries and construction, the estimation methodology depends on the production process. When there is physical contact between combustion gases and products (i.e. in sintering and lime kilns in the iron and steel industry; in cement kilns, glass ovens, ceramic ovens and dryers and lime kilns in the pulp and paper industry) or when combustion occurs also with the purpose of recovery of combustion products (e.g. the recovery boiler in the pulp and paper industry – green liquor) emissions are estimated using produced quantities of product as AD and EFs expressed as mass of GHG emitted per tonne of production. For other cases, the methodology used is based on the energy consumption and the corresponding EFs. In these other cases, Portugal uses various sources to obtain the AD. For LPS installations, the sources of AD are data resulting from the implementation of the large combustion plant directive,[9] air pollution inventory sources, EU ETS verified reports, special surveys and direct requests to large combustion plant operators. To complete the energy consumption data at the national level, the energy balance is used. The values of the EFs are specific EFs from direct measurements at LPS installations (for industries such as chemicals, pulp and paper, ceramic and glass) or from the literature (e.g. the *EMEP/EEA Air Pollutant Emission Inventory Guidebook*),[10] sometimes differentiating by type of fuel and place of combustion (e.g. boilers/furnaces or static engines).

38. The ERT noted that the 2012 and 2013 review reports had recommendations that the Party use plant-specific AD for the consumption of oil waste and tar under iron and steel production. In the 2014 submission, in the NIR (table 3-19, page 3-43), the same information is provided for the time series of consumption for "oil waste" and the same figures for "tar" are provided under "other" as in the 2012 and 2013 submissions. In response to a question raised by the ERT during the review, Portugal explained that the data provided in the NIR are not correct and not consistent with the data reported in the CRF tables. The ERT recommends that the Party ensure the consistency of the reported data in the NIR and CRF tables.

39. As indicated in the 2012 and 2013 review reports, the same type of gasoline is consumed in road transportation as is reported for activities under manufacturing industries

[9] EU directive 2001/80/EC on the limitation of emissions of certain pollutants into the air from large combustion plants.

[10] Available at <http://www.eea.europa.eu/themes/air/emep-eea-air-pollutant-emission-inventory-guidebook>.

and construction and other sectors, with a CO_2 EF of 73.0 kg CO_2/GJ. In the NIR 2014 (tables 3-67 and 3-69) the Party incorrectly reported the CO_2 EF for gasoline used in static engines in manufacturing industries and construction as 69.3 t CO_2/TJ (equivalent to 69.3 kg CO_2/GJ). In response to a question raised by the ERT during the review, the Party explained that the CO_2 EF used to estimate the CO_2 emissions from gasoline used in the category other sectors is 73.7 kg CO_2/GJ (which includes a 0.99 oxidation factor). Portugal also explained that the CO_2 EF for gasoline of 69.3 kg CO_2/GJ presented in the NIR 2014 is incorrect and the value used in the calculations is 73.0 kg CO_2/GJ. The ERT recommends that Portugal report consistent information in the CRF tables and the NIR and revise its QA/QC procedures in order to avoid discrepancies.

40. The ERT noted a recommendation made in the previous review report that the Party explain the 46.9 per cent decrease in the implied emission factor (IEF) for CH_4 for solid fuels under manufacturing industries and construction between 1990 and 2011. In the 2014 submission, the CH_4 IEFs are 3.88 kg/TJ and 2.96 kg/TJ for 2011 and 2012, respectively, which represents a 47.0 per cent and 59.6 per cent decrease compared with the CH_4 IEF for 1990 (7.32 kg/TJ). The ERT noted that this decrease is driven by the changes in the subcategory other (manufacturing industries and construction), and that the CH_4 IEFs in the other subcategories do not decrease in this manner. The ERT also noted that solid fuels are used in the subcategory other (manufacturing industries and construction) under "glass, cement, other transformation industry and extractive industries", and that the solid fuels used are different across these industries and also change for each industry across the time series. The ERT further noted that the CH_4 IEFs for different fuels in different industries are reported in the NIR (tables in section 3.3.2.3), including the source of these EFs. The ERT commends Portugal for including this information in its NIR.

41. The NIR (section 3.3.1.3.4.2, "City gas production", page 3-32) explains the estimates from "city gas" production processes, where fuels such as fuel gas, LPG, fuel oil, naphtha and natural gas are used as feedstocks, and also explains (NIR, page 3-32, footnote 13) that these quantities are included in the inventory under use of city gas as fuel. However, the ERT noted that the city gas was reported under other (manufacturing industries and construction) (NIR, table 3-57, page 3-78), commercial/institutional (NIR, table 3-112, page 3-157) and residential (NIR, table 3-114, page 3-161) and only for 1990–2001. In response to a question raised by the ERT during the review, the Party explained that the consumption of fuel gas, LPG, fuel oil, naphtha and natural gas in the production of city gas is considered to be "non-energetic" and the associated emissions are not reported directly but are reported in the combustion of city gas as a fuel. The ERT recommends that the Party improve the explanations of how these emissions are estimated and allocated.

42. Extractive industry is listed as a subcategory of manufacturing industries and construction (NIR 2014, chapter 3.3.2). In response to a question raised by the ERT during the review on what kind of activities are included in this subcategory, Portugal explained that "extractive industry" includes the fuel consumption in activities related to the extraction of materials (minerals, stone and sand) from mines and quarries and in the production of coal. Portugal also explained that coal production occurred only from 1990 to 1994 and that it is not possible to separate these AD from the data as a whole. For this reason, all emissions associated with extractive activities are reported aggregated under the category other (manufacturing industries and construction). The ERT understands the problem related to the separation of the fuels consumption in coal mining from the other extractive industries. The ERT recommends that Portugal explain and justify in the NIR the circumstances that led to the inclusion of the emissions from fuel consumption in coal mining elsewhere, other than under the category manufacture of solid fuels and other energy industries.

Road transportation: liquid and gaseous fuels – CO_2

43. The emission estimates for road transportation are based on the AD collected from the energy balance for all fuels (i.e. gasoline, diesel oil, LPG, natural gas and biofuel). Since the 2012 annual submission the COPERT IV model (version 9.0) has been used to estimate emissions from road transportation (NIR 2014, page 3-123).

44. CO_2 emissions from road transportation is the largest key category in the energy sector. The 2012 review report had recommended the Party develop country-specific parameters (e.g. hydrogen/carbon ratios and CO_2 EFs) for gasoline and diesel oil. In the current submission (NIR 2014, table 3-90, page 3-132), Portugal continues to use the default CO_2 EFs for gasoline and diesel oil from the Revised 1996 IPCC Guidelines. In response to a question raised by the ERT during the review, the Party explained that despite the efforts made and several discussions with the National Energy Authority and the oil companies to develop country-specific CO_2 EFs for gasoline and diesel oil, no results had been achieved so far. The ERT recommends that Portugal continue its efforts to develop country-specific CO_2 EFs for these fuels.

Railways: liquid fuels – CO_2

45. In response to a recommendation made in the 2012 review report that Portugal consistently apply the same CO_2 EF for the same type of diesel oil across all categories under which it is consumed, the Party revised and changed the CO_2 EF from 74.37 kg/GJ to 74.07 kg/GJ; the new EF being the same as that used for this type of fuel by the other mobile sources. The ERT recommends that the Party explain this recalculation in its NIR.

46. For other fuels consumed in railways, CH_4 and N_2O emissions are estimated but CO_2 emissions are reported as "NO" in CRF table 1.A(a). In response to a question raised by the ERT during the review, Portugal explained that the fuel reported under other fuels is biodiesel and that this notation key was used to indicate that biogenic CO_2 emissions are not added to the national total. The ERT recommends that Portugal include this information in its NIR.

Fugitive emissions from oil refining: all fuels – CO_2

47. In response to a question raised by the ERT during the review on how Portugal ensures that no fugitive CO_2 emissions from oil refineries are double counted or missed, Portugal explained that for the estimation of the fugitive emissions from oil refining and storage activities it uses data directly from the EU ETS. This approach allows the Party to control the separation of combusted fuels from the quantities of fuels used in activities such as flaring, fluid catalytic cracking, catalyst regeneration, platforming and hydrogen production. The CO_2 EFs are obtained directly from fuel analysis. The ERT recommends that Portugal include the information provided during the review in its NIR.

48. The ERT noted differences in the CO_2 IEF and AD for refining/storage and distribution of oil products. For example, for 2011, the CO_2 IEF for refining/storage changed from 15,662.49 kg/Mt to 14,149,334.19 kg/Mt and the CO_2 IEF for distribution of oil products changed from 551.37 kg/Mt to 679,753.41 kg/Mt. For the same year, AD for refining/storage changed from 49,297.92 Mt to 54.59 Mt and AD for distribution of oil products changed from 24,551.92 Mt to 19.23 Mt. The NIR (pages 3-187, 3-193 and 3-196) mentions that no recalculations were made in this category. In response to a question raised by the ERT during the review, Portugal explained that it corrected the AD and changed the unit: the AD in the 2013 submission were reported in kt (not Mt, as incorrectly reported), while the AD in the 2014 submission were reported in Mt. Portugal also explained that it has corrected the allocation of AD and emissions from oil exploration to oil transport. The ERT welcomes the clarifications and recommends that the Party explain all recalculations in the NIR.

4. Non-key categories

Other transportation: liquid fuels – CO_2, CH_4 and N_2O

49. Portugal reported the consumption of the fuels associated with the category other transportation activities using the notation key "IE" (included elsewhere) in CRF table 1.A(a). In response to a question raised by the ERT during the review regarding the allocation of the emissions from the combustion of the fuels used for supporting pipeline transportation activities and for ground activities in airports, Portugal explained that the fuel consumption for ground activities in airports is reported in the energy balance in item 10.7 ("Serviços") and the combustion emissions are included in the category commercial/institutional (under other sectors). Pipeline transportation activities are exclusively supported by electricity, this being also reported in the energy balance at 10.7, with the corresponding emissions being reported also under category commercial/institutional. The ERT recommends that Portugal explain in the NIR and in CRF table 1.A(a) what type of consumption is included in the item "Serviços" from the energy balance and consequently report the fuel consumption and the associated emission estimates under the appropriate category. The ERT also recommends that the Party report AD and emissions from ground activities in airports in the category other transportation.

C. Industrial processes and solvent and other product use

1. Sector overview

50. In 2012, emissions from the industrial processes sector amounted to 5,314.93 Gg CO_2 eq, or 7.7 per cent of total GHG emissions, and emissions from the solvent and other product use sector amounted to 232.71 Gg CO_2 eq, or 0.3 per cent of total GHG emissions. Since the base year, emissions have increased by 7.1 per cent in the industrial processes sector, and decreased by 26.7 per cent in the solvent and other product use sector. The key drivers for the rise in emissions in the industrial processes sector are increases in the production of cement, lime and glass, the use of limestone and dolomite, the use of HFCs for refrigeration and air-conditioning equipment and the use of SF_6 for production of electrical equipment. Within the industrial processes sector, 63.7 per cent of the emissions were from mineral products, followed by 32.2 per cent from consumption of halocarbons and SF_6, 2.7 per cent from the chemical industry and 1.3 per cent from metal production. The remaining 0.006 per cent was from other production. Emissions from production of halocarbons and SF_6 were reported as "NA" and "NO".

51. Portugal has made recalculations between the 2013 and 2014 annual submissions for the industrial processes sector. Compared with the 2013 submission, the two most significant recalculations were in mineral products (emissions decreased by 0.3 per cent for 2011 and increased by 2.8 per cent for 1990) and in metal production (emissions for 2011 decreased by 25.7 per cent; no impact for 1990). The recalculations in AD for lime production were made owing to revised data from national statistics. The recalculation for limestone and dolomite use was made following recommendations made in previous review reports and to correct errors. Compared with the 2013 annual submission, the recalculations (including those made in response to the list of potential problems and further questions raised by the ERT during the review; see paras. 52, 61 and 62 below) decreased emissions in the industrial processes sector for 2011 by 32.70 Gg CO_2 eq (0.6 per cent), increased emissions for this sector for 1990 by 95.57 Gg CO_2 eq (2.0 per cent), and decreased total national emissions for 2011 by 0.05 per cent. The recalculations were adequately explained.

52. Portugal submitted revised estimates for CO_2 emissions from soda ash use (see para. 61 below) and for CH_4 emissions from the production of ethylene (reported under other (chemical industry); see para. 62 below) in its response to the list of potential problems and

further questions raised by the ERT at the end of the review week. For 2012, the revised estimates increased emissions from mineral products by 3.3 per cent and decreased emissions from the chemical industry by 4.2 per cent.

53. Portugal's inventory for the industrial process sector is generally transparent. However, the ERT recommends that the Party improve the transparency of the information on how the consistency of the time series is ensured for subcategories for which EU ETS data are used for only some years in the period 1990–2012 (e.g. see para. 55 below).

54. The ERT welcomes the efforts made by Portugal to provide information on the sector-specific QA/QC activities that have been implemented in the NIR. However, information related to QA/QC activities is still missing; for example, for limestone and dolomite use and for glass production (reported under other (mineral products)). In response to a question raised by the ERT during review, the Party stated that there are specific QA/QC activities for other industrial processes and this information will be included in future submissions. The ERT recommends that Portugal include this information in future submissions.

2. Key categories

Cement production – CO_2

55. Portugal has used a country-specific methodology which is based on raw material characterization and plant-specific carbon content (based on CO_2 emissions reported under the EU ETS) for the years 2005–2009. For the period 1990–2004, the CO_2 emissions were estimated using a back-casting methodology using plant-specific raw material consumption and the plant-specific average carbon content for the period 2005–2009. The ERT encourages Portugal to improve its back-casting methodology by considering the national and sectoral circumstances for the period 1990–2004 rather than simply assuming the same carbon content as the average for 2005–2009. The ERT noted that the fluctuation in the IEF for the years 2005–2012 (ranging from 0.514 t CO_2/t to 0.525 t CO_2/t) was a result of a change in the recirculation rate at one plant, which reduced the amount of alternative fuels (partially composed of biomass) needed. In response to a question raised by the ERT during the review, Portugal explained that it will clarify the methodological description in order to be fully consistent with the methodology used in the calculation. The ERT recommends that Portugal implement this improvement.

56. As part of its QC activities, Portugal compares the AD received from each individual plant with the data compiled by the National Statistics Institute (INE).[11] In response to questions raised during the review, Portugal provided information on the comparison of data for 1992–2012 between the two sources. The ERT encourages Portugal to provide information on the results of the comparison of the data sources not only in graphs but also with tables.

Lime production – CO_2

57. Portugal used a country-specific methodology to estimate CO_2 emissions from lime production for the period 2005–2012 that is based on the amount of calcium carbonate and magnesium carbonate in the raw materials consumed. For the period 1990–2004, Portugal estimated emissions by using the IEF for 2005 (0.72 t CO_2/t) and production data for 1990–2004 from the INE. The ERT noted that the IEF for the years 1990–2004 (and 2005) is different from the IEF from 2006 onwards (0.68–0.78 t CO_2/t). In response to a question raised by the ERT during the review about the consistency of the time series, Portugal

[11] *Instituto Nacional de Estatística.*

explained that it intends to improve the consistency of the time series, using plant-specific data. The ERT recommends that Portugal ensure the consistency of the entire time series.

Limestone and dolomite use – CO_2

58. The ERT welcomes the effort made by Portugal to reallocate emissions from limestone and dolomite use for wet flue gas desulphurization to the industrial processes sector rather than to the energy sector, as recommended by the previous review report. However, the ERT noted that the CO_2 IEF for 1990–2007 (0.45–0.46 t CO_2/t) is different from the IEF for 2008–2012 (0.55–0.70 t CO_2/t). In response to a question raised by the ERT during the review relating to the differences in the IEF after 2008, Portugal explained that this is caused by incomplete AD on desulphurization for 1990–2007 (however, emissions were reported correctly). The ERT recommends that Portugal complete the AD on limestone and dolomite use to improve time-series consistency.

Consumption of halocarbons and SF_6 – HFCs and SF_6

59. The ERT noted that the two models used to estimate the potential and actual HFC and SF_6 emissions are based on many assumptions; these assumptions are described in the NIR (pages 4-43 to 4-77) and are based mainly on expert judgement or default values from the IPCC *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* (hereinafter referred to as the IPCC good practice guidance) or the *2006 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the 2006 IPCC Guidelines). The ERT also noted that Portugal has compared the results of the models, thereby allowing the Party to verify the assumptions and results. The ERT recommends that Portugal enhance the transparency of its reporting by providing information on the outcomes of the comparison of the results from the two models. The ERT encourages the Party to integrate this comparison into its QA/QC plan.

60. HFC emissions from fire extinguishers have been estimated using a country-specific method comparable to a tier 2 top-down approach from the IPCC good practice guidance. However, the ERT considers that the transparency of the description of the methodology in the NIR is not sufficient. In response to a question raised by the ERT during the review, the Party stated that estimates are based on expert judgement provided by the Portuguese Fire Protection Association (APSEI)[12] and that it assumed that 96 per cent of annual sales of HFCs are used to charge new fire protection equipment. The ERT appreciates the new information and recommends that Portugal provide in the NIR more detailed information on the methodology and other parameters used to estimate HFC emissions from fire extinguishers.

3. Non-key categories

Soda ash production and use – CO_2

61. Portugal reports CO_2 emissions from soda ash use in CRF table 2(I).A-G as "NA". CO_2 emissions from soda ash use in glass production are reported under other (mineral products). Emissions from soda ash use in the iron and steel industry (NIR, page 4-11) and in the paper and pulp industry, fertilizer industry and ceramics industry (brick, tiles and pavement) (NIR, page 4-12) are reported under limestone and dolomite use, but other possible soda ash uses (e.g. chemicals, soaps, detergents, flue gas desulphurization) are not taken into account. The ERT notes that the Revised 1996 IPCC Guidelines (page 2.12) explicitly state that "Carbon dioxide emissions are associated with the use of soda ash. Some of the major uses include glass manufacture, chemicals, soaps, detergents and flue gas desulphurization. For each of these uses, it is assumed that for each mole of soda ash

[12] *Associação Portuguesa de Segurança.*

use, one mole of CO_2 is emitted". In response to a question raised by the ERT during the review, Portugal indicated the amounts of soda ash produced in Portugal for every year in the time series 1990–2012. The ERT noted that compared with international statistical data the apparent consumption of soda ash in Portugal (production plus imports minus exports) is substantially higher than consumption of soda ash reported in the inventory. The ERT considered that Portugal could be underestimating emissions and included this issue in the list of potential problems and further questions raised by the ERT during the review. In its response to this list, Portugal recalculated emissions from soda ash use based on an apparent-consumption approach instead of using sales data for soda ash. The ERT considers that the potential underestimation has been resolved. However, the ERT noted that figure 4-18 in the NIR is inconsistent with the information provided during the review (the figure should not include soda ash). The ERT also noted that Portugal has reported the AD for soda ash use in tonnes in CRF table 2(I).A-G, but that the AD should be reported in kt (the emissions are not affected by this error). The ERT recommends that the Party correct these two discrepancies. The ERT considers that the Party may be double counting the AD (and the emissions) for soda ash by reporting them under both soda ash use and limestone and dolomite use. The ERT recommends that Portugal review these estimates.

Other (chemical industry) – CO_2 and CH_4

62. Portugal reports CO_2 and CH_4 emissions from ethylene production under other (chemical industry). The ERT noted that CH_4 emissions from ethylene production are constant for the years 1998–2012 (0.20 Gg) while emissions of CO_2 and non-methane volatile organic compounds (NMVOCs) are increasing in the same period (e.g. for CO_2, from 6.94 Gg in 1998 to 8.45 Gg in 2012). In response to a question raised by the ERT during the review, Portugal stated that the AD to estimate CH_4 emissions were wrongly reported as constant since 1998. Portugal also indicated that it will provide new estimates based on monitoring data for the specific plant (there is only one plant in the country producing ethylene) in the next submission. However, the ERT considered that the current submission contains a potential underestimation of CH_4 emissions from ethylene production for the period 1998–2012 and included this issue in the list of potential problems and further questions raised by the ERT during the review. In its response to this list, Portugal submitted revised AD and emissions (CO_2, CH_4 and NMVOC) from other (chemical industry), using AD directly from the facility from 1998 onwards (Portugal was using assumptions in the estimates submitted previously). The ERT considers that the potential underestimation has been resolved. The ERT recommends that Portugal explain the changes in the estimation methodology, including the data sources, and the changes in the emission estimates.

D. Agriculture

1. Sector overview

63. In 2012, emissions from the agriculture sector amounted to 7,223.81 Gg CO_2 eq, or 10.5 per cent of total GHG emissions. Since 1990, emissions have decreased by 11.0 per cent. The key driver for the fall in emissions is the reduction in synthetic fertilizer use and in the amount of animal manure applied to soils. Within the sector, 40.7 per cent of the emissions were from agricultural soils, followed by 37.8 per cent from enteric fermentation, 18.4 per cent from manure management and 2.5 per cent from rice cultivation. The remaining 0.6 per cent was from field burning of agricultural residues. Estimates of emissions from the prescribed burning of savannah were reported as "NO".

64. Portugal has made recalculations between the 2013 and 2014 annual submissions for this sector. The most significant recalculations were in enteric fermentation (emissions increased by 0.7 per cent in 1990 and decreased by 1.5 per cent in 2011), rice cultivation

(emissions decreased by 34.6 per cent and 59.5 per cent for 1990 and 2011, respectively) and in agricultural soils (emissions increased by 0.7 per cent and 1.8 per cent for 1990 and 2011, respectively). The recalculations for enteric fermentation and rice cultivation were made in response to recommendations in the 2013 annual review report to improve the methodologies used, and the recalculations for N_2O emissions from agricultural soils were made mainly because of a revision in data for synthetic fertilizers based on INE data as well as the inclusion of N_2O emissions from sewage sludge applied to soils (NIR, section 6.2). Compared with the 2013 annual submission, the recalculations decreased emissions in the agriculture sector for 2011 by 264.25 Gg CO_2 eq (3.5 per cent) and decreased total national emissions by 0.4 per cent. The recalculations were adequately explained in the NIR and the CRF tables.

65. The 2012 annual review report recommended that Portugal estimate the emissions from agricultural soils due to the application of sewage sludge as a soil amendment. In response to this recommendation, Portugal has estimated emissions of N_2O from sewage sludge applied to agricultural soils in the 2014 submission and explains the method and data used in the NIR (sections 6.3.5.4.3 and 6.3.6 and table 6-38). The ERT commends the Party for the recalculation in response to the 2012 recommendation.

66. The ERT noted that Portugal has made efforts to improve the transparency of its CRF tables and NIR in the 2014 submission, in particular by providing information on average live weight of dairy cattle in the CRF tables and by better documenting the explanations of recalculations in the NIR, as recommended in previous review reports. The ERT commends the Party for these efforts. However, the ERT notes that the NIR contains many untitled or unnumbered figures and tables (e.g. figures on pages 6-33, 6-61, 6-68 and 6-81 and table on page 6-43). The ERT also notes that the NIR indicates (page 6-45, footnote 110) that the CH_4 EFs for manure management for all subclasses of non-dairy cattle are provided in an annex, but the NIR does not contain this annex. In response to a question raised by the ERT during the review, Portugal acknowledged the errors in the NIR and provided the missing annex to the ERT. The ERT recommends that Portugal address these issues and continue improving the transparency and the QC procedures of its reporting to reduce the number of inconsistencies and errors within the NIR and between the CRF tables and the NIR.

67. Previous review reports have identified that Portugal carries out the uncertainty analysis using a tier 1 methodology and IPCC default values (from the IPCC good practice guidance) for the uncertainties associated with the AD and EFs, or by using country-specific uncertainty values derived from non-scientific assumptions. The ERT notes that table 9-1 of the NIR states that implementing the recommendation made in previous review reports that the Party develop and include country-specific uncertainty values for the AD and EFs, at a minimum for the key categories, and document them fully in the NIR requires further development. The ERT reiterates the recommendation.

2. Key categories

Manure management – CH_4

68. The ERT noted that a significant proportion of swine manure is managed in anaerobic lagoons or anaerobic digesters (85.0 per cent reported for anaerobic lagoons in CRF table 4.B(a) for 2012). The ERT also notes that Portugal reports the recovery of CH_4 from biogas production from manure management under the energy sector. In response to a question raised by the ERT regarding the amount of manure processed in anaerobic digesters and the quantity of CH_4 generated, utilized, flared or recovered annually, Portugal provided the ERT with a spreadsheet for manure management for swine including the quantity of CH_4 recovered for the year 2012. The amount of CH_4 recovered represents, on average, 1.0 per cent of swine CH_4 emissions from manure management. The ERT

recommends that Portugal provide such detailed information in a table in the NIR, outlining the number of anaerobic digesters used to manage swine manure, the quantity of manure managed and the CH_4 recovered. The ERT reiterates the recommendation made in the 2012 review report that Portugal follow the methodological approach provided in the footnote to table 4.10 of the IPCC good practice guidance in order to correctly reflect the practice of anaerobic digestion of swine manure, and that Portugal document this approach in the NIR.

Direct soil emissions – N_2O

69. Previous review reports noted that Portugal frequently undertakes recalculations of the consumption of mineral nitrogen (N) fertilizers applied to soils. The NIR mentions that at the time of reporting the latest data available from INE do not include the latest year to be reported in the inventory (i.e. 2012 for the 2014 submission) because of time frames that are incompatible with those of the data provider. In table 9-1 of the NIR, Portugal mentions that meetings with INE have taken place and that INE intends to revise the methodology used so that it can estimate fertilizer consumption data sooner. The ERT welcomes the Party's efforts to resolve this issue and reiterates the recommendations made in previous review reports that Portugal implement QC measures which obviate the need to conduct recalculations of the consumption of mineral N fertilizers. As recommended in the 2012 review report, Portugal has clarified in its NIR that the INE fertilizer data used in the current inventory submission includes all mineral N fertilizers applied to soils, including those applied to forest land. The ERT welcomes this clarification.

3. Non-key categories

Rice cultivation – CH_4

70. The ERT noted that Portugal revised the estimates for CH_4 from rice cultivation in response to a recommendation made in the 2013 annual review report. Portugal revised the CH_4 EF used to estimate CH_4 from rice cultivation. Portugal now uses the default "EFc" (seasonally integrated EF for continuously flooded fields) of 20 g/m^2/season (IPCC good practice guidance, table 4.22). Portugal considers this to be the most appropriate EFc, as a country-specific EFc has not yet been determined. The ERT notes that the reported IEFs in the CRF tables for CH_4 for rice cultivation vary across the time series, ranging from 17.16 g/m^2 to 36.20 g/m^2 for the last four years (2009–2012). These values differ from the EFs provided in table 6-29 of the NIR 2014 (page 6-49), which range from 21 g/m^2 to 35 g/m^2. In response to a question raised by the ERT during the review, Portugal stated that there was a compilation error and the harvested areas reported (the AD) were not the correct ones but the reported CH_4 emissions were correct, resulting in incorrect IEFs being reported in the CRF tables. Portugal provided the ERT with a file showing the estimation of CH_4 from rice cultivation for all years with the correct AD and the same emissions as reported in the CRF tables. The ERT recommends that Portugal enhance its QC procedures to ensure the accuracy of its CRF tables and the NIR.

E. Land use, land-use change and forestry

1. Sector overview

71. In 2012, net removals from the LULUCF sector amounted to 10,647.91 Gg CO_2 eq. Compared with 1990, the LULUCF sector has changed from a net source of emissions (58.01 Gg CO_2 equivalent for 1990) to a net sink. The key drivers for the transition from net emissions to net removals are: increases in removals in forest land mainly owing to afforestation and preventing and combating forest fires; and the reduction of emissions from cropland and grassland as a result of the introduction of carbon sequestration incentives in agricultural and grassland soils. These processes were somewhat offset by the

increase of emissions from settlements due to urban expansion and building of infrastructure. Within the sector, 12,527.81 Gg CO_2 eq of net removals were from forest land, followed by 1,560.05 Gg CO_2 eq from other land and 417.55 Gg CO_2 eq from other (LULUCF). Net emissions were reported from settlements (2,355.55 Gg CO_2 eq), cropland (708.65 Gg CO_2 eq), wetlands (403.99 Gg CO_2 eq) and grassland (389.31 Gg CO_2 eq).

72. Portugal has made recalculations between the 2013 and 2014 annual submissions for this sector. The two most significant recalculations between the 2013 submission and the estimates submitted in May 2014 were in forest land (net removals increased by 2,299.3 per cent and 129.2 per cent for 1990 and 2011, respectively) and cropland (net emissions decreased by 25.7 per cent and 81.6 per cent for 1990 and 2011, respectively). The recalculations were mainly made following: the changes in AD, which had been foreseen in the Party's NIR 2013 (i.e. the replacement of the information on land use and land-use changes in mainland Portugal with data from land-use cartography of 1995, 2007 and 2010 that was recently made available for the GHG inventory); the revision of the soil EF; and the revision of annual burned areas per land use (using the revised information released in 2013). Compared with the 2013 annual submission, the recalculations changed from net emissions (8,496.18 Gg CO_2 eq) to net removals (–2,288.96 Gg CO_2 eq) for 1990, and increased net removals by 208.4 per cent for 2011. The recalculations were adequately explained.

73. In addition to the recalculations indicated in paragraph 72 above, Portugal also submitted revised estimates for the carbon stock changes in mineral soils and the losses of biomass in forest land in response to the list of potential issues and further questions raised by the ERT during the review (see paras. 81–85 and 87 below). For 2012, the revised estimates decreased the net removals from forest land and from other land by 2,340.09 Gg CO_2 eq (20.8 per cent) and 332.22 Gg CO_2 eq (17.8 per cent), respectively, and increased the net emissions from cropland and grassland by 10.78 Gg CO_2 eq (1.5 per cent) and 118.66 Gg CO_2 eq (43.8 per cent), respectively.

74. The ERT identified a number of issues concerning transparency in the NIR, including the country-specific definition of important variables such as mean annual increment (MAI) and wood volume. The ERT recommends that Portugal provide all methodological information in the NIR that is required by the IPCC good practice guidance for LULUCF.

75. To estimate the annual area change for each land use, Portugal reported in its NIR (page 7-4) that it assumed that annual land-use changes were constant for the period 1995–2007 and 2007–2012 and equal to the average annual land-use area changes derived in those periods. Portugal has full aerial photography cover for mainland Portugal for 1995, 2007 and 2010 (see para. 76 below), and it obtained estimates for 2011 and 2012 by extrapolation. In response to a question raised by the ERT during the review, Portugal explained that 2010, which was the year of the last data collection (by remote sensing methodology), was the middle year of the first commitment period and that it considered that extrapolating the trend observed until 2010 for 2011 and 2012 was adequate in the context of the images available as well as the cost (and time) of producing full territory maps. Portugal also explained that sections 7.1.2.3.1 and 7.1.2.3.2 of the NIR include a number of assumptions that are used to develop land-use change information. The ERT recommends that Portugal continue to improve both the accuracy and the transparency of its AD in order to comply with the methodological requirements of the IPCC good practice guidance for LULUCF. The ERT also recommends that Portugal continue to collect data on land-use change. In case of any interpolation or extrapolation, the ERT notes that section 4.2.4.3.1 of the IPCC good practice guidance for LULUCF requires that the documentation of estimates of GHG emissions and removals must include "the information, rationale and assumptions that were used to develop reported data and results, in cases they were not

directly available from databases (for instance if interpolation or extrapolation methods have been applied)".

76. The main information source for the identification of land use and land-use change for the period 1995–2012 is the land-use cartography,[13] using full aerial photography cover of mainland Portugal available for 1995, 2007 and 2010. According to the Party, the calculated uncertainty of the maps differs from year to year: 13.2 per cent for 1995; 10.8 per cent for 2007; and 11.3 per cent for 2010. For the period 1970–1994, different methods were used for estimating forest land (based on the national forest inventory) and for cropland and grassland (interpolation and extrapolation using data from the General Census of Agriculture from 1979, 1989 and 1999). The methods include the application of assumptions, expert judgement and interpolation (see para. 75 above), applied to maintain time-series consistency. In response to a question raised by the ERT during the review, Portugal informed the ERT that a recalculation of data for the years since 2011 based on new information will be carried out before the end of the second commitment period under the Kyoto Protocol.

77. When country-specific living biomass values for perennial crops are not available, Portugal relies on data from Spain. In response to a question raised by the ERT during the review as to what extent Spanish data apply to Portugal's lands, the Party reported that Spain shares the same climatic conditions as Portugal and the management systems and crop varieties for the perennial crops mentioned in table 7-17 of the NIR are very similar. Portugal also explained that in the absence of country-specific data, and given that default values for perennial crops (table 3.3.2 in the IPCC good practice guidance for LULUCF) were considered (by expert judgement) to be too high for the conditions of Portugal, the Party decided to use the data from Spain as an alternative (and better) data source. The ERT recommends that Portugal provide information on the applicability of each data set that is not country-specific, and document all information and considerations that lead to the application of these data.

78. Portugal reports uncertainty values for the LULUCF sector under the Convention for most of the AD as well as for EFs and other factors. Combined uncertainty values (for AD and EF) are also reported, but no detailed methodology of how the combined uncertainties were estimated was included in the NIR. In response to a question raised by the ERT during the review, Portugal reported that the uncertainty analysis applied was based on a tier 1 methodology proposed by the IPCC good practice guidance and the IPCC good practice guidance for LULUCF, and that the uncertainty estimates were calculated on the basis of the error propagation rules, which combine the uncertainty associated with the AD and the uncertainty associated with the EF or the other factors. The ERT recommends that Portugal include this information in its NIR.

2. Key categories

Forest land remaining forest land – CO_2

79. Portugal uses data from its national forest inventory (NFI) from 1995 (NFI4) and 2005 (NFI5) to develop average volume per hectare and average MAI data. The methodology on how the MAI is defined and estimated is not reported in the NIR. The ERT recommends that the Party report this methodology in detail.

80. The ERT noted that, even if MAI data are assumed to be constant, changes of forest area caused by site fertility can occur over time so these data should be verified from time to time in order to ensure their accuracy. In response to a question raised by the ERT during

[13] *Cartografia de Ocupação de Solo.*

the review as to whether Portugal can report new data for the first commitment period, Portugal explained that NFIs are carried out every 10 years, that the work for NFI6 has begun and fieldwork is expected to be carried out in 2014. The Party also explained that the data could not be used to produce estimates for the 2014 annual submission because the processed information (i.e. final results of NFI6) will not be ready before mid or late 2015. The ERT recommends that Portugal complete its NFI6 and use the results to report updated estimates based on the new inventory information.

81. The ERT noted that to estimate carbon stock gains in the biomass carbon pool in forest land remaining forest land, Portugal applies method 1 (the default method) from the IPCC good practice guidance for LULUCF. The ERT notes that the default method is sensitive to the accurate estimation of both gains and losses. To estimate gains in the biomass carbon pool, Portugal accounts for woody increment for all areas. This gain is estimated based on the MAI but, as no methodological description is reported in the NIR concerning how the MAI is defined or how the MAI values reported in the NIR were developed, it is not clear from the NIR if the MAI contains any losses. In response to a question raised by the ERT during the review, Portugal explained that the MAI excludes losses of all sorts.

82. The ERT also noted that to estimate emissions from the biomass carbon pool in forest land, Portugal accounts for the following losses:

(a) A loss resulting from forest fires in all forests, where the amount of pre-fire biomass is reduced by species-specific mortality rates (based on expert judgement (NIR, page 7-57));

(b) Losses from harvests for two main species, *Pinus pinaster* and *Eucalyptus* spp. (based on statistics);

(c) Losses from harvest for the other species, which, according to NIR figure 7-6, occupy about half of the forest area (based on an assumption of 25 per cent of the MAI of these species (NIR, page 7-35)).

83. For the two main species (*Pinus pinaster* and *Eucalyptus* spp.), the ERT considers that all losses are accounted for by applying the fire and the harvest statistics. However, it is not clear from the NIR whether all losses from harvests in the forests for the other species (including *Quercus suber*, *Quercus rotundifolia*, *Pinus pinea* and *Castanea sativa*) are accounted for. More specifically, it is not clear how much harvest is actually taking place and it is not clear how much of the losses result from thinnings, natural processes such as self-thinning and disturbances, including fires.

84. In response to a question raised by the ERT during the review concerning harvests in forests, Portugal explained that it is illegal to harvest *Quercus suber* and *Quercus rotundifolia*, but pruning of these two species (to increase acorn production and for firewood) is a common practice. Portugal also explained that *Pinus pinea* and *Castanea sativa* are managed mostly for fruit production for human consumption, and although they can be harvested for industry, the high value of the fruit does not create an incentive for harvesting of whole trees (although pruning to increase fruit production is a common practice). The other species are often associated with forests that are protected (e.g. for biodiversity, slopes, riparian corridors), so their harvesting is also marginal. For all these forests, Portugal reported that the value of 25 per cent of the MAI was introduced to be conservative in the estimation of emissions from harvests.

85. However, the ERT considers that the value of 25 per cent is an expert judgement for part of an important emission in a key category. As such, its validity was questioned by the ERT on two grounds:

(a) Part of these forests is either old (in the >60 years category, depending on species) or unevenly aged. They may therefore have reached their carbon equilibrium, in which case all losses combined would equal the MAI;

(b) The expert judgement should be documented and archived, and included the information provided in accordance with that listed in page 6.11 of the IPCC good practice guidance.

86. To address the above issues, and in response to the potential problem for forest management (see para. 116 below), Portugal revised its methodology and submitted revised estimates for carbon stock changes in living biomass for forest land remaining forest land. The ERT considers that the revised estimates for forest land remaining forest land are in line with the IPCC good practice guidance for LULUCF.

87. Portugal's revised estimates (submitted in November 2014) for "losses from living biomass" from forest land now include all previously considered "loss types" as well as an estimation of natural mortality (other than the mortality caused by forest fires). According to information received from the Party, the loss type "natural mortality" was estimated from data from the NFI5 on the percentage of standing dead trees, which is further subdivided into burned dead trees and other dead trees. Dead trees were assumed to have died over the past three years (which the Party and the ERT consider is a conservative estimate) to derive annual mortality rates. This percentage was then applied to standing volume of all forest types on an annual basis. The value "3 years" is an expert judgement that is regarded as a conservative estimate of natural mortality. It results from considering the time it would take for a standing dead tree to fall (expert judgement: 5–10 years) or to be removed by forest managers for sanitary purposes. The ERT recommends that the Party include this explanation and the expert judgements in future submissions and revisions of the NIR, and that the Party validate the expert judgements and/or replace them with specific measurements.

88. Portugal's estimates for the loss type "other wood use" are derived from expert judgement and, as such, are not based on real data. The value of 25 per cent was decided between the GHG reporting experts of APA and the NFI experts from the Institute for Nature Conservation and Forests.[14] This value was introduced as an attempt to cover for undeclared wood harvesting, which is not captured by the official statistics. The ERT recommends that the Party include this explanation and the respective expert judgement in future submissions and revisions of the NIR, and that the Party validate the expert judgement and/or replace it with specific measurements.

Forest land converted to other land categories – CO_2

89. Portugal reports average biomass volume per hectare and per tree species by forest type in two tables of the NIR (tables 7-11 and 7-12). The data in these tables are average values. In response to a question raised by the ERT during the review about how the Party estimated biomass on land that was converted from forest land to any other land use, Portugal reported that as it is not possible to know the exact biomass in each deforested plot, it has assumed that the average biomass presented in those tables was completely lost in each deforested hectare (i.e. all hectares of a particular subcategory had the same EF). The ERT considers that this method needed verification in order to ensure that emissions from deforestation are not underestimated (see para. 115 below).

[14] *Instituto da Conservação da Natureza e das Florestas*.

Land converted to forest land – CO_2

90. In the NIR (section 7.2.2.2.2) Portugal reports that "the harvesting under lands converted to forest was estimated based on the area planted in year i-12 and assuming a harvest rate of 100 m^3/ha." However, the ERT notes that if increment values are net values (i.e. they include all losses such as self-thinning), harvests at the age of 12 years should be equal to 12 × MAI = 12 × 9.5 m^3/ha (as reported in the NIR, table 7-10) = 114 m^3/ha. In response to a question raised by the ERT during the review, Portugal reported that 114 m^3/ha was used in the calculations, and the value reported in the NIR was incorrect. The ERT recommends that Portugal address this inconsistency.

91. In order to estimate carbon stock changes in the mineral soil pool resulting from land-use conversions including to and from forest land and conversions between species within the forest land remaining forest land category, Portugal applies a tier 2 methodology from the IPCC good practice guidance for LULUCF. In doing so, Portugal multiplied the area estimates in subcategories of the land-use change matrices (e.g. NIR, table 7-8, page 7-9) by respective country-specific stock change emission/removal factors in a matrix of similar structure (NIR, table 7-23, page 7-31). Portugal calculated these emission/removal factors for each land-use change category as the difference between overall mean carbon stocks of the respective subcategories. These mean carbon stocks (i.e. the values in table 7-21 on page 7-29 of the NIR) were estimated by taking soil samples from the entire area of these subcategories. The ERT notes that these mean carbon stock values were estimated in a sampling programme that focused on developing accurate mean carbon stock estimates for the various land-use types, rather than on mean carbon stock changes that occur as a result of land-use changes. Depending on the nature of land conversions, the differences between the carbon stocks of the respective land-use subcategories may be considerably larger or smaller than the actual carbon stock changes.

92. The ERT further notes that when taking soil samples to collect country-specific data for the conversion categories, the IPCC good practice guidance for LULUCF indicates (page 3.92) that "it is critical that the plots being compared have similar pre-conversion histories and management as well as similar topographic position, soil physical properties and be located in close proximity" and that this is typically, although not exclusively, achieved using paired plot comparisons. The ERT considers that Portugal's approach to develop its country-specific stock change factors does not comply with the above requirement. The ERT considers that, depending on local situations and on combinations of conversions from and to subcategories, the approach used by Portugal might involve artefacts that may result in the underestimation of emissions and overestimation of removals in the mineral soil pool. For example, for 2012, Portugal has reported increases of carbon stocks in mineral soils of 30.52 Gg carbon for forest land remaining forest land whereas the application of the default method from the IPCC good practice guidance for LULUCF would result in zero net removals in mineral soils. This problem also affects estimates of carbon stock changes under afforestation and reforestation, deforestation and forest management.

93. To address the above issues, and in response to a potential problem identified under afforestation and reforestation, deforestation and forest management (see paras. 114, 115 and 116 below), Portugal revised its methodology and also submitted revised estimates for carbon stock changes in mineral soils for land-use conversions including to and from forest land. In its resubmission, Portugal recognized that its methodology to estimate EFs in soils may be limited when estimating real emission and sequestration factors for mineral soils, in particular for land-use changes. According to the Party, these limitations are mostly derived from the relatively low number of plots available, which do not allow for a fine stratification of the information available per region, climate zone or soil type, without seriously increasing uncertainty. Portugal plans to be able to refine the processing of its

emission and removal factors from mineral soils by adding information from mineral soils, which will be collected for the next NFI in 2015, and from the results of the next Land Use/Cover Area frame statistical Survey (LUCAS) soil sampling campaign, also in 2015. In the interim, and while no new information is available to resolve the data limitations mentioned above, Portugal takes a conservative approach to the EFs that result from the application of equation 3.3.3 from the IPCC good practice guidance for LULUCF, which includes the following elements: emission and removal factors are set to zero where the difference in carbon stocks is not statistically significant; removal factors from soils, as calculated with equation 3.3.3, are replaced with the lower value of the confidence interval at 50 per cent confidence; and EFs of transitions to and from wetlands and settlements are set to zero.

94. The ERT commends Portugal for the development of its inventory estimation system with respect to mineral soils (see para. 93 above). The ERT considers that Portugal has a relatively large sample of soil carbon that covers many land-use types. This sample is a good basis on which to develop an accurate system to estimate carbon stock changes for all land use and land-use change situations. The ERT also considers that the inherently high variety of soil properties in the many land use and land-use change subcategories (especially in a land-use change matrix of 19 × 19 cells, which Portugal applies) together with the specific nature of carbon stock changes owing to land-use change might still limit the accuracy of the estimation of real emission and removal factors for mineral soils, in particular for land-use changes. However, the proposed revised approach by Portugal is currently the best possible one: it is conservative and, relative to the original submission, greatly reduces the risk of both underestimating emissions and overestimating removals in particular subcategories. Therefore, the ERT accepts this revised approach.

95. Nevertheless, the ERT recommends that Portugal further develop its sampling and estimation system. This development could include a re-analysis of the currently available information to further refine emission and removal factors and to optimize future sampling designs. The development should in any event be based on relevant methodological guidance provided by the IPCC, according to which estimating carbon stock changes in land-use change categories requires specific considerations depending on whether a tier 2 or tier 3 method is applied. The ERT notes that page 3.92 of the IPCC good practice guidance for LULUCF indicates that "[i]n evaluating existing studies or conducting new measurements it is critical that the plots being compared have similar pre-conversion histories and management as well as similar topographic position, soil physical properties and be located in close proximity." The ERT also notes for the next submission that the IPCC 2006 Guidelines provide detailed guidance on how carbon stock changes in mineral soils should be estimated in its section "Tier 2 Approach: Incorporating country-specific data" (volume 4, chapter 2, pages 2.37–2.39). This guidance covers several possible ways to develop estimates. The ERT recommends that Portugal develop its sample system and the application of this system in developing carbon stock change estimates (emission and removal factors) by considering the above-mentioned guidelines, noting that if plot samples are used it is good practice that the plots being compared have similar pre-conversion histories and management as well as similar topographic position, soil physical properties and be located in close proximity.

Cropland remaining cropland – CO_2

96. Portugal reports on gains in soils from areas under no tillage in the entire period 1990–2012. The ERT considers that it is not transparently demonstrated that non-tillage of cropland occurred in the base year (1990). In response to a question raised by the ERT during the review, Portugal explained that the areas accounted for as no tillage were all the result of the application of economic incentives from agri-environmental measures that started, for no tillage, in 2004. Before that time the use of no tillage outside experimental

plots and farms was marginal. The ERT recommends that Portugal include this information in its NIR.

Grassland remaining grassland – CO_2

97. Portugal reports carbon stock gains in soils from areas under biodiverse pastures (NIR, page 7-42). In response to a question raised by the ERT during the review, the Party explained that the sowing of pasture started in the 1990s and that the area subject to sowing in the pre-1990 period was not significant; therefore, the activity sowing of biodiverse pastures in 1990 was reported as zero. The Party also provided data on the expansion of the activity of a company specialized in selling seed mixtures for biodiverse pastures. Before 1990 the area of sown biodiverse permanent pastures rich in legumes was not significant and it remained very low until about 1995. Portugal also provided detailed information on the system of financing biodiverse sowing in the country. The ERT recommends that Portugal include this information in its NIR to increase transparency.

F. Waste

1. Sector overview

98. In 2012, emissions from the waste sector amounted to 8,185.37 Gg CO_2 eq, or 11.9 per cent of total GHG emissions. Since 1990, emissions have increased by 36.6 per cent, mainly owing to increases in solid waste generation and disposal, especially in the early years of the time series 1990–2012. The key drivers for the increased waste generation have been population growth and urbanization since 1960, and increased industrial production. Since the beginning of 2000 the rising trend of emissions from solid waste has stabilized and alternatives to solid waste treatment, such as the incineration of waste, are used increasingly. Emissions from wastewater treatment have been more stable; the growth caused by population increase and the rise in emissions owing to the load of organic material and nitrogen in wastewater have been counteracted by an increase in and more efficient treatment of wastewater. Within the sector, 61.6 per cent of the emissions were from solid waste disposal on land, followed by 38.0 per cent from wastewater handling. The remaining 0.4 per cent was from waste incineration.

99. Portugal has made recalculations between the 2013 and 2014 annual submissions for this sector. The two most significant recalculations were in solid waste disposal on land (emissions decreased by 0.2 per cent for 2011; no impact for 1990) and in wastewater handling (emissions decreased by 0.1 per cent and 0.5 per cent for 1990 and 2011, respectively). The recalculations were made in response to recommendations in previous review reports and updates in AD. Compared with the 2013 annual submission, the recalculations decreased emissions in the waste sector by 21.68 Gg CO_2 eq (0.3 per cent), and decreased total national emissions by 0.03 per cent. The recalculations were adequately explained.

100. Portugal includes in its reporting sources for which methodologies have not been provided in the Revised 1996 IPCC Guidelines or IPCC good practice guidance; for example, N_2O emissions from industrial wastewater treatment and CH_4 and N_2O emissions from the combustion of landfill gas in flares. The ERT commends Portugal for its efforts in reporting estimates for categories for which methodologies are not available.

101. Portugal's NIR for the waste sector does not fully follow the outline in the "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories" (hereinafter referred to as the UNFCCC reporting guidelines) or the annotated outline. This reduces the transparency of the NIR and makes the assessment of the contents difficult in some places. The ERT encourages Portugal to follow the outline for the NIR included in

the annex to the UNFCCC reporting guidelines. The ERT also encourages the Party to improve the transparency of the information by providing data for waste generation and composition (including information on the shares of the different treatments) in the introductory part and complementing the documentation under the category-specific sections, because these data are common for solid waste disposal on land, waste incineration and composting (reported under other (waste)).

102. Portugal uses different sources of data, complemented by expert judgement and interpolations/extrapolations for AD in this sector, but does not address time-series consistency separately (i.e. the NIR does not follow the outline in the UNFCCC reporting guidelines). The ERT also noted that methods chosen for the estimation of missing AD are not always explained and justified in the NIR (see para. 103 below). The ERT recommends that Portugal address these time-series consistency issues separately for each category, explaining how it ensures time-series consistency when combining the data from different sources, and explain the reasoning for the choice of methods used to estimate missing data.

2. Key categories

Solid waste disposal on land – CH_4

103. Portugal estimates the CH_4 emissions from municipal and industrial solid waste disposal on land using the first-order decay (FOD) method consistent with the Revised 1996 IPCC Guidelines and the IPCC good practice guidance. The AD (waste disposal amount and composition) are derived from several sources over time. The available data do not cover the whole time period required for the calculations, and the missing data are therefore calculated based on expert judgement (for the period 1960–1994) and based, for example, on population data and urbanization rates. The ERT encourages Portugal to improve the documentation on the time-series consistency by clearly indicating the method used to interpolate or extrapolate missing AD for a specific time frame, and provide justifications when country-specific methods are used in this context.

104. Portugal uses many country-specific parameters in applying the FOD method. The ERT considers that the reasoning for the choice of parameters is in some cases arbitrary, although the parameters used are within the ranges given in the IPCC good practice guidance. For example, the half life and waste generation rate constant (k value) have been chosen as those used by the United States of America. The ERT recommends that Portugal review these parameters taking into account its national circumstances. The ERT further encourages Portugal to document these and any other parameter choices transparently in the NIR.

Wastewater handling – CH_4 and N_2O

105. Portugal estimates CH_4 emissions from industrial wastewater treatment using a country-specific method. The total organic waste in industrial wastewater is calculated based on statistical industrial production data multiplied by "pollution coefficients".[15] The pollutant coefficients are taken from a relatively old study, from 1985. As a QA measure, Portugal has compared the estimates resulting from the country-specific methodology with those of the IPCC good practice guidance. The comparison presented in the NIR indicates that the methodology produces estimates similar to those obtained using the IPCC methodology and that the emissions for the most recent years are not underestimated. The ERT encourages Portugal to review the need to update the methodology or any parameters

[15] The pollution coefficients are an alternative to the wastewater generation times the chemical oxygen demand in industrial wastewater.

used in the calculations based on more recent scientific and technical information on CH_4 and N_2O emissions from wastewater treatment.

106. Portugal estimates N_2O emissions from human sewage using the default method in the Revised 1996 IPCC Guidelines. Since the 2013 submission the Party has also reported the N_2O emissions from sludge spreading in the agriculture sector, based on recommendations made in previous review reports. The ERT commends Portugal for addressing these recommendations. However, the documentation under the waste sector in the NIR has not been updated to reflect this change. The ERT recommends that Portugal update the description, including any methodological changes.

107. Portugal reports N_2O emissions from industrial wastewater treatment using an EF given in the EMEP/CORINAIR guidebook of 2002.[16] The EF was developed in 1991 for the Netherlands. Portugal does not explain the applicability of the EF to its national circumstances in the NIR. The ERT notes that the Revised 1996 IPCC Guidelines and IPCC good practice guidance do not include a methodology for N_2O emissions from industrial wastewater treatment, whereas the 2006 IPCC Guidelines include these emissions partly in the emissions from discharge of wastewater. The ERT commends Portugal for its efforts in reporting beyond the mandatory requirements and encourages the Party to evaluate and revise, as appropriate, its methodology for estimating these emissions, avoiding double counting.

3. Non-key categories

Waste incineration – CO_2, CH_4 and N_2O

108. The ERT noted that Portugal has complemented its documentation on category-specific QC procedures by including a comparison for AD used in the inventory to estimate the emissions from waste incineration with corresponding data in the energy balance. The ERT welcomes this information and encourages Portugal to continue these comparisons and to explore reasons behind the differences.

G. Supplementary information required under Article 7, paragraph 1, of the Kyoto Protocol

1. Information on activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol

Overview

109. Table 6 provides an overview of the information reported and parameters selected by Portugal under Article 3, paragraphs 3 and 4, of the Kyoto Protocol.

Table 6
Supplementary information reported under Article 3, paragraphs 3 and 4, of the Kyoto Protocol

Issue	*Expert review team assessment, if applicable*	*Findings and recommendations*
Assessment of Portugal's reporting in accordance with the requirements in paragraphs 5–9 of the annex to decision 15/CMP.1	Sufficient	

[16] European Monitoring and Evaluation Programme (EMEP)/Co-ordinated Information on the Environment in the European Community (CORINAIR). 2002. *EMEP/CORINAIR Atmospheric Emission Inventory Guidebook.* See table 2, page B9101-2.

Issue	*Expert review team assessment, if applicable*	*Findings and recommendations*
Activities elected under Article 3, paragraph 4, of the Kyoto Protocol	Forest management, cropland management and grazing land management Years reported: 1990, 2008–2012	See paragraphs 116 and 117 below
Period of accounting	Commitment period	
Portugal's ability to identify areas of land and areas of land-use change in accordance with paragraph 20 of the annex to decision 16/CMP.1	Sufficient	See paragraphs 76 above and 111 and 112 below

110. Section G.1 includes the ERT's assessment of the 2014 annual submission against the Article 8 review guidelines and decisions 15/CMP.1 and 16/CMP.1. In accordance with decision 6/CMP.9, Parties will begin reporting of KP-LULUCF activities in the submissions due by 15 April 2015 using revised CRF tables, as contained in the annex to decision 6/CMP.9. Owing to this change in the CRF tables for KP-LULUCF activities, and the change from the first commitment period to the second commitment period, paragraphs 111–119 below contain the ERT's assessment of Portugal's adherence to the current guidelines for reporting and do not provide specific recommendations for reporting of these activities for the 2015 annual submission.

111. For the identification of land, different sources of information covering different periods were used for mainland Portugal and for the territories Azores and Madeira, which may introduce inconsistencies. Also, the basis for the estimation of land-use changes for Madeira included the Coordination of Information on the Environment (CORINE) Land Cover database which, depending on the version used (i.e. resolution 100 × 100 m or 250 × 250 m), may only provide a low resolution (i.e. areas of 6.25 ha), which is insufficient to meet the area requirements of decision 16/CMP.1, annex, paragraph 16 (0.05–1 ha). The ERT considers that this probably does not result in an underestimation of emissions in the base year or an overestimation of removals in other years, but recommends that Portugal continue to develop its land area identification system for Madeira to ensure that its land use and land-use change identification system meets the area requirements indicated above.

112. As described in paragraph 94 above, the ERT is of the view that the accuracy provided by the system of Portugal to estimate carbon stock changes in mineral soils is limited. However, the proposed revised approach by Portugal (see para. 93 above) is conservative and, compared with the original submission, reduces the risk of both underestimating emissions and overestimating removals in particular subcategories. However, the ERT recommends that Portugal develop its estimation system as described in paragraph 95 above.

113. As indicated in the 2012 review report, the Party has not provided in its NIR a quantitative analysis of the uncertainties for the emissions/removals from activities under Article 3, paragraph 3, of the Kyoto Protocol or the elected activities (forest management, cropland management and grazing land management) under Article 3, paragraph 4, of the Kyoto Protocol. In response to a question raised by the ERT during the review, the Party reported that it was not yet possible to produce these estimates. The ERT recommends that Portugal conduct an uncertainty analysis of the estimates for these activities.

Activities under Article 3, paragraph 3, of the Kyoto Protocol

Afforestation and reforestation – CO_2

114. As described in paragraphs 91 and 92 above, the ERT identified methodological problems which could mean that in the estimations of carbon stock changes in the mineral soil pool Portugal may be underestimating the emissions or overestimating the removals for afforestation and reforestation. The ERT included this issue in the list of potential problems and further questions raised by the ERT during the review. In its response to this list, Portugal submitted revised estimates both for the LULUCF sector and for activities under Article 3, paragraph 3, of the Kyoto Protocol (see para. 93 above). The ERT considers that the potential problem is resolved (see para. 94 above).

Deforestation – CO_2

115. As described in paragraphs 91 and 92 above, the ERT identified methodological problems which could mean that in the estimations of carbon stock changes in the mineral soil pool Portugal may be underestimating the emissions or overestimating the removals for deforestation. The ERT included this issue in the list of potential problems and further questions raised by the ERT during the review. In its response to this list, Portugal submitted revised estimates both for the LULUCF sector and for activities under Article 3, paragraph 3, of the Kyoto Protocol (see para. 93 above). The ERT considers that the potential problem is resolved (see para. 94 above).

Activities under Article 3, paragraph 4, of the Kyoto Protocol

Forest management – CO_2

116. As described in paragraphs 91 and 92 above, the ERT identified methodological problems which could mean that in the estimations of carbon stock changes in the mineral soil pool Portugal may be underestimating the emissions or overestimating the removals for forest management. The ERT included this issue in the list of potential problems and further questions raised by the ERT during the review. In its response to this list, Portugal submitted revised estimates both for the LULUCF sector and for activities under Article 3, paragraph 3, of the Kyoto Protocol (see para. 93 above). The ERT considers that the potential problem is resolved (see para. 94 above).

117. As described in paragraphs 81–85 above, the ERT identified methodological problems which could mean that in the estimations of carbon stock changes in the biomass pool Portugal may be underestimating the emissions or overestimating the removals for forest management. The ERT included this issue in the list of potential problems and further questions raised by the ERT during the review. In its response to this list, Portugal submitted revised methodologies and estimates (see paras. 86–88 above). The ERT considers that the potential problem has been resolved.

Cropland management

118. No issues to be reported identified.

Grazing land management

119. No issues to be reported identified.

2. Information on Kyoto Protocol units

Standard electronic format and reports from the national registry

120. Portugal has reported information on its accounting of Kyoto Protocol units in the required SEF tables, as required by decisions 15/CMP.1 and 14/CMP.1. The ERT took note of the findings and recommendations included in the standard independent assessment

report (SIAR) on the SEF tables and the SEF comparison report.[17] The SIAR was forwarded to the ERT prior to the review, pursuant to decision 16/CP.10. The ERT reiterated the main findings and recommendations contained in the SIAR.

121. Information on the accounting of Kyoto Protocol units has been prepared and reported in accordance with decision 15/CMP.1, annex, chapter I.E, and reported in accordance with decision 14/CMP.1 using the SEF tables. This information is consistent with that contained in the national registry and with the records of the international transaction log (ITL) and the clean development mechanism registry and meets the requirements referred to in decision 22/CMP.1, annex, paragraph 88(a–j). The transactions of Kyoto Protocol units initiated by the national registry are in accordance with the requirements of the annex to decision 5/CMP.1 and the annex to decision 13/CMP.1. However, the ERT reiterates the recommendation included in the SIAR that the publicly available information be updated. No discrepancy has been identified by the ITL and no non-replacement has occurred. The national registry has adequate procedures in place to minimize discrepancies.

Accounting of activities under Article 3, paragraph 3, of the Kyoto Protocol and any elected activities under Article 3, paragraph 4, of the Kyoto Protocol

122. Portugal has reported information on its accounting of KP-LULUCF in the accounting table, as included in the annex to decision 6/CMP.3. Information on the accounting of KP-LULUCF has been prepared and reported in accordance with decisions 16/CMP.1 and 6/CMP.3.

123. Table 7 shows the accounting quantities for KP-LULUCF as reported by Portugal and the final values after the review.

Table 7
Accounting quantities for activities under Article 3, paragraph 3, and activities under Article 3, paragraph 4, of the Kyoto Protocol, in t CO_2 eq

	2014 annual submission[a]		
	As reported	*Revised estimates*	*Final accounting quantity*[b]
Afforestation and reforestation			
Non-harvested land	–33 275 574	–27 346 300	–27 346 300
Harvested land	0		0
Deforestation	9 587 129	10 107 906	10 107 906
Forest management	–4 033 333		–4 033 333
Article 3.3 offset[c]	0		0
Forest management cap[d]	–4 033 333		–4 033 333
Cropland management	–17 143 407	–17 071 505	–17 071 505
Grazing land management	–5 481 320	–6 416 813	–6 416 813
Revegetation	NA		NA

[17] The SEF comparison report is prepared by the international transaction log (ITL) administrator and provides information on the outcome of the comparison of data contained in Portugal's SEF tables with corresponding records contained in the ITL.

Abbreviations: CRF = common reporting format, KP-LULUCF = land use, land-use change and forestry emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, NA = not applicable.

[a] The values included under the 2014 annual submission are the cumulative accounting values for 2008, 2009, 2010, 2011 and 2012, as reported in the accounting table of the KP-LULUCF CRF tables for the inventory year 2012.

[b] The "final accounting quantity" is the quantity of Kyoto Protocol units that Portugal shall issue or cancel under each activity under Article 3, paragraph 3, and paragraph 4, if relevant, based on the final accounting quantity in the 2014 annual submission.

[c] "Article 3.3 offset": for the first commitment period, a Party included in Annex I to the Convention that incurs a net source of emissions under the provisions of Article 3, paragraph 3, of the Kyoto Protocol may account for anthropogenic greenhouse gas emissions by sources and removals by sinks in areas under forest management under Article 3, paragraph 4, up to a level that is equal to the net source of emissions under the provisions of Article 3, paragraph 3, but not greater than 9.0 megatonnes of carbon times five, if the total anthropogenic greenhouse gas emissions by sources and removals by sinks in the managed forest since 1990 is equal to, or larger than, the net source of emissions incurred under Article 3, paragraph 3.

[d] In accordance with decision 16/CMP.1, annex, paragraph 11, for the first commitment period only, additions to and subtractions from the assigned amount of a Party resulting from forest management under Article 3, paragraph 4, of the Kyoto Protocol after the application of decision 16/CMP.1, annex, paragraph 10, and resulting from forest management project activities undertaken under Article 6, shall not exceed the value inscribed in the appendix of the annex to decision 16/CMP.1, times five.

124. Based on the information provided in table 7 for the activity afforestation and reforestation, Portugal shall: for non-harvested land, issue 27,346,300 removal units (RMUs) in its national registry; and for harvested land, neither issue nor cancel any units in its national registry.

125. Based on the information provided in table 7 for the activity deforestation, Portugal shall cancel 10,107,906 assigned amount units, emission reduction units, certified emission reduction units and/or RMUs in its national registry.

126. Based on the information provided in table 7 for the activity forest management, Portugal shall issue 4,033,333 RMUs in its national registry.

127. Based on the information provided in table 7 for the activity cropland management, Portugal shall issue 17,071,505 RMUs in its national registry.

128. Based on the information provided in table 7 for the activity grassland management, Portugal shall issue 6,416,813 RMUs in its national registry.

Calculation of the commitment period reserve

129. Portugal has reported its commitment period reserve in its 2014 annual submission. Portugal reported that its commitment period reserve has not changed since the initial report review (343,743,774 t CO_2 eq) as it is based on the assigned amount and not the most recently reviewed inventory (NIR, page 11-1). The ERT agrees with this figure. Although Portugal submitted revised emission estimates on 20 November 2015 in response to the list of potential problems and further questions raised by the ERT, the value of the commitment period reserve has remained the same.

3. Changes to the national system

130. Portugal reported that there are changes in its national system since the previous annual submission. Portugal described the changes in its NIR. Since August 2013 the former Ministry for the Environment and Land Use Planning (the ministry responsible for the national GHG inventory) has encompassed the energy attribution, being renamed Ministry for the Environment, Land Use Planning and Energy. Portugal also highlighted that the previously interrupted contract with the company supporting the inventory

preparation has been re-established. The ERT concluded that Portugal's national system continues to be in accordance with the requirements of national systems outlined in decision 19/CMP.1.

4. Changes to the national registry

131. Portugal reported that there are changes in its national registry since the previous annual submission. In its NIR Portugal described the changes in the name or contact person, changes to the database structure, changes regarding conformance to technical standards and changes regarding test results. The ERT concluded that, taking into account the confirmed changes in the national registry, Portugal's national registry continues to perform the functions set out in the annex to decision 13/CMP.1 and the annex to decision 5/CMP.1 and continues to adhere to the technical standards for data exchange between registry systems in accordance with relevant decisions of the Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol (CMP).

5. Minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol

132. Consistent with paragraph 23 of the annex to decision 15/CMP.1, Portugal provided information relating to how it is striving, under Article 3, paragraph 14, of the Kyoto Protocol, to implement its commitments in such a way as to minimize adverse social, environmental and economic impacts on developing country Parties, particularly those identified in Article 4, paragraphs 8 and 9, of the Convention.

133. Portugal reported on key policies and measures, including the implications of its Energy Strategy and the European Union renewables directive. Portugal also reported on the cooperation with developing countries in order to improve the integration of adaptation for sectoral policies and instruments of planning, vulnerabilities and risks associated with climate change.

134. Portugal did not provide information on changes in its reporting of the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol in its annual submission. However, the ERT identified that there are changes in its reporting under Article 3, paragraph 14 and, in response to questions raised by the ERT during the review, Portugal elaborated on its cooperation with developing countries, particularly the Portuguese-speaking countries in Africa, describing the process of approval of projects. The ERT concluded that, taking into account the confirmed changes in the reporting, the information provided is complete and transparent. The ERT recommends that Portugal, in its annual submission, report any change(s) in its information provided under Article 3, paragraph 14, of the Kyoto Protocol in accordance with decision 15/CMP.1, annex, chapter I.H, and/or further relevant decisions of the CMP.

III. Conclusions and recommendations

A. Conclusions

135. Table 8 summarizes the ERT's conclusions on the 2014 annual submission of Portugal, in accordance with the Article 8 review guidelines.

Table 8
Expert review team's conclusions on the 2014 annual submission of Portugal

Issue	*Expert review team assessment*	*Paragraph cross-references*
The ERT concludes that the inventory submission of Portugal is complete with regard to categories, gases, years and geographical boundaries and contains both an NIR and CRF tables for 1990–2012		
Annex A sources[a]	Complete	Table 3
LULUCF[a]	Complete	
KP-LULUCF	Complete	
The ERT concludes that the inventory submission of Portugal has been prepared and reported in accordance with the UNFCCC reporting guidelines	Yes	
Portugal's inventory is in accordance with the Revised 1996 IPCC Guidelines, the IPCC good practice guidance and the IPCC good practice guidance for LULUCF	Generally	Table 4, paragraphs 16, 68, 75. 77, 92 and 95
The submission of information required under Article 7, paragraph 1, of the Kyoto Protocol has been prepared and reported in accordance with decision 15/CMP.1	Yes	111–112
Portugal has reported information on its accounting of Kyoto Protocol units in accordance with decision 15/CMP.1, annex, chapter I.E, and used the required reporting format tables as specified by decision 14/CMP.1	Yes	
The national system continues to perform its required functions as set out in the annex to decision 19/CMP.1	Yes	
The national registry continues to perform the functions set out in the annex to decision 13/CMP.1 and the annex to decision 5/CMP.1 and continues to adhere to the technical standards for data exchange between registry systems in accordance with relevant CMP decisions	Yes	
Did Portugal provide information in the NIR on changes in its reporting of the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol?	No	134

Abbreviations: Annex A sources = source categories included in Annex A to the Kyoto Protocol, CMP = Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol, CRF = common reporting format, ERT = expert review team, IPCC = Intergovernmental Panel on Climate Change, IPCC good practice guidance = IPCC *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*, IPCC good practice guidance for LULUCF = IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry*, KP-LULUCF = LULUCF emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, LULUCF = land use, land-use change and forestry, NIR = national inventory report, Revised 1996 IPCC Guidelines = *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*, UNFCCC reporting guidelines = "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories".

[a] The assessment of completeness by the ERT considers only the completeness of reporting of mandatory categories (i.e. categories for which methods and default emission factors are provided in the Revised 1996 IPCC Guidelines, the IPCC good practice guidance or the IPCC good practice guidance for LULUCF).

B. Recommendations

136. The ERT identified the issues for improvement listed in table 9. All recommendations are for the next annual submission, unless otherwise specified. The ERT notes that this review report of the 2014 annual submission will be published after 15 April 2015. Where recommendations cannot be fully implemented in time for the 2015 annual submission, the ERT recommends that Portugal provide an update on progress of implementation in the NIR.

Table 9
Recommendations identified by the expert review team

Sector	*Category/cross-cutting issue*	*Recommendation*	*Reiteration of previous recommendation?*	*Paragraph cross-references*
Cross-cutting	QA/QC	Implement additional QC procedures to avoid errors and discrepancies in the CRF tables and the NIR	No	Table 3
		Provide information on the QC activities and their results	No	12
	Uncertainty analysis	Revise and update the uncertainty data for AD and EFs	Yes	Table 4
		Improve the reporting of the uncertainty analysis by providing in the NIR the results of the level of uncertainty for the last reported year and showing the results of the analysis in the table in the annex	No	17
	Key categories	Identify key categories in accordance with the IPCC good practice guidance for LULUCF	No	16
	Inventory management	Improve the archiving system by providing further description on the record-keeping and archiving procedures	Yes	18
	Follow-up to previous reviews	Implement all recommendations made in previous review reports	Yes	19
Energy	Comparison of the reference approach with the sectoral approach and international statistics	Improve the consistency between the energy balance and the data available for LPS, and the split between domestic and international energy consumption for aviation and navigation	No	25
		Provide complete information related to the appropriate conversion factors for all fuels in the reference approach and the sectoral approach	No	26
	International bunker fuels	Improve the estimation of international aviation bunkers and resolve the discrepancy between the energy balance and IEA data	No	27

Sector	*Category/cross-cutting issue*	*Recommendation*	*Reiteration of previous recommendation?*	*Paragraph cross-references*
	Feedstocks and non-energy use of fuels	Implement the planned revision and further development of the reporting of feedstocks and non-energy use of fuels and explain transparently the estimates and the notation keys reported in CRF table 1.A(d)	No	28
		Correct the inconsistency of the reported data of LPG consumption in CRF tables 1.A(b) and 1.A(d) and the NIR	No	29
		Specify the fuel for "other non-specified" in non-energy use of fuels to improve transparency	No	30
		Explain the estimation of CO_2 emissions resulting from the use of natural gas for hydrogen production in one refinery	No	31
	Stationary combustion: all fuels – CO_2, CH_4 and N_2O	Analyse and consider in the emission estimates the humidity content of the incinerated wastes to ensure that the corresponding emissions are not overestimated	No	34
		Move the methodological description of the CO_2 emissions from limestone used for desulphurization in the NIR from the energy sector to the industrial processes sector	No	35
		Include the information provided during the review on the estimations of plant-specific CO_2 EFs and AD for liquid and gaseous fuels combusted for energy purposes in the category petroleum refining in the NIR	No	36
		Ensure consistency of the reported data for the consumption of oil waste and tar under iron and steel production in the CRF tables and the NIR	No	38
		Report consistent information on the CO_2 EF for gasoline in the NIR and the CRF tables; revise the QA/QC procedures	No	39
		Improve the explanations of how the emissions of fuel gas, LPG, fuel oil, naphtha and natural gas in the production of city gas are estimated and allocated	No	41
		Explain and justify in the NIR the circumstances which led to the inclusion of the emissions from fuel consumption in coal mining other than under the category manufacture of solid fuels and other energy industries	No	42

Sector	*Category/cross-cutting issue*	*Recommendation*	*Reiteration of previous recommendation?*	*Paragraph cross-references*
	Road transportation: liquid and gaseous fuels – CO_2	Continue with the efforts to develop country-specific CO_2 EFs for gasoline and diesel oil	No	44
	Railways: liquid fuels – CO_2	Provide an explanation of the recalculation of the CO_2 EF in the NIR	No	45
		Include in the NIR the information provided during the review to verify that the fuel reported under other fuels is biodiesel	No	46
	Fugitive emissions from oil refining: all fuels – CO_2	Include in the NIR the information provided during the review on how Portugal ensures that no fugitive CO_2 emissions from oil refineries are double counted or missed	No	47
		Explain all recalculations in the NIR	No	48
	Other transportation: liquid fuels – CO_2, CH_4 and N_2O	Explain in the NIR and in CRF table 1.A(a) what type of consumption is included in the item "Serviços" from the energy balance and consequently report the fuel consumption and the associated emission estimates under the appropriate category	No	49
		Report AD and emissions from ground activities in airports under the category other transportation	No	49
Industrial processes and solvent and other product use	Time-series consistency	Improve the transparency of the information on how the consistency of the time series is ensured for subcategories for which EU ETS data are used for only some years in the period 1990–2012	No	53
	QA/QC	Include information in the NIR on specific QA/QC activities for industrial processes for which this information is not currently included	No	54
	Cement production – CO_2	Clarify the methodological description	No	55
	Lime production – CO_2	Ensure the consistency of the entire time series to estimate CO_2 emissions from lime production	No	57
	Limestone and dolomite use – CO_2	Complete the AD on limestone and dolomite use to improve time-series consistency	No	58

Sector	*Category/cross-cutting issue*	*Recommendation*	*Reiteration of previous recommendation?*	*Paragraph cross-references*
	Consumption of halocarbons and SF_6 – HFCs and SF_6	Enhance the transparency of the reporting by providing information on the outcomes of the comparison of the results from the two models used to estimate the potential and actual HFC and SF_6 emissions	No	59
		Provide in the NIR more detailed information on the methodology and other parameters used to estimate HFC emissions from fire extinguishers	No	60
	Soda ash production and use – CO_2	Correct figure 4-18 in the NIR to be consistent with the information provided during the review, report the AD for soda ash use in kt in CRF table 2(I).A-G, and review the AD and emission estimates reported for soda ash to ensure that no double counting occurs	No	61
	Other (chemical industry) – CO_2 and CH_4	Explain the changes in the estimation methodology for the CO_2 and CH_4 emissions from ethylene production, including the data sources, and the changes in the emission estimates	No	62
Agriculture	Transparency and consistency	Ensure consistency within the NIR and between the CRF tables and the NIR, and continue improving the transparency and the QC procedures	No	66
	Uncertainty analysis	Develop and include country-specific uncertainty values for the AD and EFs, at a minimum for the key categories, and document them fully in the NIR	Yes	67
	Manure management – CH_4	Provide detailed information on the estimates for swine manure management	No	68
		Follow the methodological approach provided in the IPCC good practice guidance (table 4.10, footnote) to correctly reflect the practice of anaerobic digestion of swine manure, and document this approach in the NIR	Yes	68
	Direct soil emissions – N_2O	Implement QC measures which obviate the need to conduct recalculations of the consumption of mineral nitrogen fertilizers	Yes	69
	Rice cultivation – CH_4	Enhance the QC procedures to ensure the accuracy of the CRF tables and the NIR	No	70
LULUCF	Transparency	Provide all methodological information in the NIR that is required by the IPCC good practice guidance for LULUCF	No	74

Sector	*Category/cross-cutting issue*	*Recommendation*	*Reiteration of previous recommendation?*	*Paragraph cross-references*
		Continue to improve both the accuracy and the transparency of the AD in order to comply with the methodological requirements of the IPCC good practice guidance for LULUCF and continue to collect data on land-use change	No	75
		Provide information on the applicability of each data set that is not country-specific, and document all information and considerations that lead to the application of these data	No	77
	Uncertainty analysis	Include in the NIR the information on the uncertainty analysis provided to the ERT during the review	No	78
	Forest land remaining forest land – CO_2	Report the methodology on how the MAI is defined and estimated in detail	No	79
		Complete the NFI6 to develop the average volume per hectare and average MAI data and use the results to report updated estimates based on the new inventory information	No	80
		For "losses from living biomass" from forest land, explain the methodology used and the expert judgements and validate the expert judgements and/or replace them with specific measurements	No	87
		For the loss type "other wood use", include the explanation provided during the review and the respective expert judgements and validate the expert judgement and/or replace it with specific measurements	No	88
	Land converted to forest land – CO_2	Address the inconsistency in the reporting of the value of harvesting under lands converted to forest in the calculations and in the NIR	No	90
		Develop further the sampling and estimation system and the application of the sampling system in developing carbon stock change estimates	No	95
	Cropland remaining cropland – CO_2	Include the information provided during the review on non-tillage of cropland occurring in the base year (1990) in the NIR	No	96
	Grassland remaining grassland – CO_2	Include the information on the reporting of carbon stock gains in soils from areas under biodiverse pastures in the NIR to increase transparency	No	97

Sector	*Category/cross-cutting issue*	*Recommendation*	*Reiteration of previous recommendation?*	*Paragraph cross-references*
Waste	Time-series consistency	Address the time-series consistency issues separately for each category, explaining how the Party ensures time-series consistency when combining the data from different sources, and explain the reasoning for the choice of methods used to estimate missing data	No	102
	Solid waste disposal on land – CH_4	Review the parameters used, taking into account the national circumstances	No	104
	Wastewater handling – CH_4 and N_2O	Update the description of the estimation methodology, including any methodological changes	No	106
Information on activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol	Land area identification	Continue to develop the land area identification system for Madeira to ensure that the land use and land-use change identification system meets the indicated area requirements	No	111
	Accuracy	Develop the estimation system for carbon stock changes in mineral soils	No	112
	Uncertainty analysis	Conduct an uncertainty analysis of the estimates for the activities of the uncertainties	No	113
National registry	Publicly available information	Update the publicly available information on the accounting of Kyoto Protocol units	No	121
Article 3, paragraph 14, of the Kyoto Protocol	Transparency	Report any change(s) in the information provided under Article 3, paragraph 14, of the Kyoto Protocol	No	134
General		Where recommendations cannot be fully implemented in time for the 2015 annual submission, provide an update on progress of implementation in the NIR	No	136

Abbreviations: AD = activity data, CRF = common reporting format, EF = emission factor, ERT = expert review team, EU ETS = European Union Emissions Trading System, IEA = International Energy Agency, IPCC = Intergovernmental Panel on Climate Change, IPCC good practice guidance for LULUCF = IPCC Good Practice Guidance for Land Use, Land-Use Change and Forestry, LPG = liquefied petroleum gas, LPS = large point sources, LULUCF = land use, land-use change and forestry, MAI = mean annual increment, NFI6 = sixth national forest inventory, NIR = national inventory report, QA/QC = quality assurance/quality control.

IV. Questions of implementation

137. No questions of implementation were identified by the ERT during the review.

Annex I

Information to be included in the compilation and accounting database

Table 10
Information to be included in the compilation and accounting database in t CO_2 eq for 2012, including the commitment period reserve

	As reported	*Revised estimates*	*Adjustment*[a]	*Final*[b]
Commitment period reserve	343 743 774			343 743 774
Annex A emissions for 2012				
CO_2	50 310 489	50 411 756		50 411 756
CH_4	12 249 677	12 250 289		12 250 289
N_2O	4 479 172			4 479 172
HFCs	1 667 324			1 667 324
PFCs	NA, NO			NA, NO
SF_6	45 232			45 232
Total Annex A sources[c]	**68 751 894**	**68 853 774**		**68 853 774**
Activities under Article 3, paragraph 3, for 2012				
3.3 Afforestation and reforestation on non-harvested land for 2012	–6 117 467	–4 885 492		–4 885 492
3.3 Afforestation and reforestation on harvested land for 2012	335 410	350 670		350 670
3.3 Deforestation for 2012	2 026 172	2 086 108		2 086 108
Activities under Article 3, paragraph 4, for 2012[d]				
3.4 Forest management for 2012	–8 978 902	–7 852 793		–7 852 793
3.4 Cropland management for 2012	275 748	295 711		295 711
3.4 Cropland management for the base year	3 686 746	3 687 109		3 687 109
3.4 Grazing land management for 2012	–31 814	73 525		73 525
3.4 Grazing land management for the base year	1 173 801	1 449 840		1 449 840
3.4 Revegetation for 2012				
3.4 Revegetation for the base year				

Abbreviations: Annex A sources = source categories included in Annex A to the Kyoto Protocol, NA = not applicable, NO = not occurring.

[a] "Adjustment" is relevant only for Parties for which the expert review team has calculated one or more adjustment(s).

[b] "Final" includes revised estimates, if any, and/or adjustments, if any.

[c] The values for "Total Annex A sources" in the columns "As reported", "Revised estimates" and "Final" may not equal the sum of the values for the gases in those columns owing to rounding.

[d] Activities under Article 3, paragraph 4, are relevant only for Parties that elected one or more such activities.

Table 11
Information to be included in the compilation and accounting database in t CO_2 eq for 2011

	As reported	*Revised estimates*	*Adjustment*[a]	*Final*[b]
Annex A emissions for 2011				
CO_2	51 154 635	51 243 100		51 243 100
CH_4	12 112 860	12 116 401		12 116 401
N_2O	4 512 517			4 512 517
HFCs	1 492 898			1 492 898
PFCs	NA, NO			NA, NO
SF_6	43 641			43 641
Total Annex A sources[c]	**69 316 549**	**69 408 557**		**69 408 557**
Activities under Article 3, paragraph 3, for 2011				
3.3 Afforestation and reforestation on non-harvested land for 2011	–6 543 447	–5 414 144		–5 414 144
3.3 Afforestation and reforestation on harvested land for 2011	398 619	410 824		410 824
3.3 Deforestation for 2011	1 956 685	2 041 240		2 041 240
Activities under Article 3, paragraph 4, for 2011[d]				
3.4 Forest management for 2011	–11 179 484	–10 312 757		–10 312 757
3.4 Cropland management for 2011	253 158	270 511		270 511
3.4 Cropland management for the base year	3 686 746	3 687 109		3 687 109
3.4 Grazing land management for 2011	1 331	98 408		98 408
3.4 Grazing land management for the base year	1 173 801	1 449 840		1 449 840
3.4 Revegetation for 2011				
3.4 Revegetation for the base year				

Abbreviations: Annex A sources = source categories included in Annex A to the Kyoto Protocol, NA = not applicable, NO = not occurring.

[a] "Adjustment" is relevant only for Parties for which the expert review team has calculated one or more adjustment(s).

[b] "Final" includes revised estimates, if any, and/or adjustments, if any.

[c] The values for "Total Annex A sources" in the columns "As reported", "Revised estimates" and "Final" may not equal the sum of the values for the gases in those columns owing to rounding.

[d] Activities under Article 3, paragraph 4, are relevant only for Parties that elected one or more such activities.

Table 12
Information to be included in the compilation and accounting database in t CO_2 eq for 2010

	As reported	*Revised estimates*	*Adjustment*[a]	*Final*[b]
Annex A emissions for 2010				
CO_2	52 491 893	52 588 112		52 588 112
CH_4	11 922 778	11 926 867		11 926 867
N_2O	4 808 146			4 808 146
HFCs	1 367 806			1 367 806
PFCs	1			1
SF_6	43 567			43 567
Total Annex A sources[c]	**70 634 192**	**70 734 499**		**70 734 499**
Activities under Article 3, paragraph 3, for 2010				
3.3 Afforestation and reforestation on non-harvested land for 2010	–6 609 250	–5 355 749		–5 355 749
3.3 Afforestation and reforestation on harvested land for 2010	461 803	470 954		470 954
3.3 Deforestation for 2010	1 977 596	2 086 769		2 086 769
Activities under Article 3, paragraph 4, for 2010[d]				
3.4 Forest management for 2010	–9 652 125	–8 676 084		–8 676 084
3.4 Cropland management for 2010	240 980	255 724		255 724
3.4 Cropland management for the base year	3 686 746	3 687 109		3 687 109
3.4 Grazing land management for 2010	81 555	170 492		170 492
3.4 Grazing land management for the base year	1 173 801	1 449 840		1 449 840
3.4 Revegetation for 2010				
3.4 Revegetation for the base year				

Abbreviation: Annex A sources = source categories included in Annex A to the Kyoto Protocol.

[a] "Adjustment" is relevant only for Parties for which the expert review team has calculated one or more adjustment(s).

[b] "Final" includes revised estimates, if any, and/or adjustments, if any.

[c] The values for "Total Annex A sources" in the columns "As reported", "Revised estimates" and "Final" may not equal the sum of the values for the gases in those columns owing to rounding.

[d] Activities under Article 3, paragraph 4, are relevant only for Parties that elected one or more such activities.

Table 13
Information to be included in the compilation and accounting database in t CO_2 eq for 2009

	As reported	*Revised estimates*	*Adjustment*[a]	*Final*[b]
Annex A emissions for 2009				
CO_2	57 018 980	57 115 784		57 115 784
CH_4	11 808 029	11 809 303		11 809 303
N_2O	4 749 338			4 749 338
HFCs	1 236 721			1 236 721
PFCs	10			10
SF_6	40 893			40 893
Total Annex A sources[c]	**74 853 971**	**74 952 049**		**74 952 049**
Activities under Article 3, paragraph 3, for 2009				
3.3 Afforestation and reforestation on non-harvested land for 2009	–6 982 040	–5 805 256		–5 805 256
3.3 Afforestation and reforestation on harvested land for 2009	524 963	531 061		531 061
3.3 Deforestation for 2009	1 890 569	2 024 360		2 024 360
Activities under Article 3, paragraph 4, for 2009[d]				
3.4 Forest management for 2009	–10 426 659	–9 902 554		–9 902 554
3.4 Cropland management for 2009	261 429	273 564		273 564
3.4 Cropland management for the base year	3 686 746	3 687 109		3 687 109
3.4 Grazing land management for 2009	144 614	225 390		225 390
3.4 Grazing land management for the base year	1 173 801	1 449 840		1 449 840
3.4 Revegetation for 2009				
3.4 Revegetation for the base year				

Abbreviation: Annex A sources = source categories included in Annex A to the Kyoto Protocol.
[a] "Adjustment" is relevant only for Parties for which the expert review team has calculated one or more adjustment(s).
[b] "Final" includes revised estimates, if any, and/or adjustments, if any.
[c] The values for "Total Annex A sources" in the columns "As reported", "Revised estimates" and "Final" may not equal the sum of the values for the gases in those columns owing to rounding.
[d] Activities under Article 3, paragraph 4, are relevant only for Parties that elected one or more such activities.

Table 14
Information to be included in the compilation and accounting database in t CO_2 eq for 2008

	As reported	*Revised estimates*	*Adjustment*[a]	*Final*[b]
Annex A emissions for 2008				
CO_2	59 792 824	59 907 290		59 907 290
CH_4	12 022 977	12 025 853		12 025 853
N_2O	5 065 076			5 065 076
HFCs	1 115 200			1 115 200
PFCs	147			147
SF_6	35 631			35 631
Total Annex A sources[c]	**78 031 855**	**78 149 196**		**78 149 196**
Activities under Article 3, paragraph 3, for 2008				
3.3 Afforestation and reforestation on non-harvested land for 2008	–7 023 369	–5 885 659		–5 885 659
3.3 Afforestation and reforestation on harvested land for 2008	588 097	591 145		591 145
3.3 Deforestation for 2008	1 736 108	1 869 428		1 869 428
Activities under Article 3, paragraph 4, for 2008[d]				
3.4 Forest management for 2008	–10 172 334	–9 544 026		–9 544 026
3.4 Cropland management for 2008	259 007	268 532		268 532
3.4 Cropland management for the base year	3 686 746	3 687 109		3 687 109
3.4 Grazing land management for 2008	191 999	264 571		264 571
3.4 Grazing land management for the base year	1 173 801	1 449 840		1 449 840
3.4 Revegetation for 2008				
3.4 Revegetation for the base year				

Abbreviation: Annex A sources = source categories included in Annex A to the Kyoto Protocol.

[a] "Adjustment" is relevant only for Parties for which the expert review team has calculated one or more adjustment(s).

[b] "Final" includes revised estimates, if any, and/or adjustments, if any.

[c] The values for "Total Annex A sources" in the columns "As reported", "Revised estimates" and "Final" may not equal the sum of the values for the gases in those columns owing to rounding.

[d] Activities under Article 3, paragraph 4, are relevant only for Parties that elected one or more such activities.

Annex II

Documents and information used during the review

A. Reference documents

Intergovernmental Panel on Climate Change. *2006 IPCC Guidelines for National Greenhouse Gas Inventories*. Available at <http://www.ipcc-nggip.iges.or.jp/public/2006gl/index.html>.

Intergovernmental Panel on Climate Change. *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*. Available at <http://www.ipcc-nggip.iges.or.jp/public/gl/invs1.htm>.

Intergovernmental Panel on Climate Change. *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*. Available at <http://www.ipcc-nggip.iges.or.jp/public/gp/english/>.

Intergovernmental Panel on Climate Change. *Good Practice Guidance for Land Use, Land-Use Change and Forestry*. Available at <http://www.ipcc-nggip.iges.or.jp/public/gpglulucf/gpglulucf.htm>.

"Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories". FCCC/SBSTA/2006/9. Available at <http://unfccc.int/resource/docs/2006/sbsta/eng/09.pdf>.

"Guidelines for the technical review of greenhouse gas inventories from Parties included in Annex I to the Convention". FCCC/CP/2002/8. Available at <http://unfccc.int/resource/docs/cop8/08.pdf>.

"Guidelines for national systems for the estimation of anthropogenic greenhouse gas emissions by sources and removals by sinks under Article 5, paragraph 1, of the Kyoto Protocol". Decision 19/CMP.1. Available at <http://unfccc.int/resource/docs/2005/cmp1/eng/08a03.pdf#page=14>.

"Guidelines for the preparation of the information required under Article 7 of the Kyoto Protocol". Decision 15/CMP.1. Available at <http://unfccc.int/resource/docs/2005/cmp1/eng/08a02.pdf#page=54>.

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FCCC/ARR/2013/PRT. Report of the individual review of the annual submission of Portugal submitted in 2013. Available at <http://unfccc.int/resource/docs/2014/arr/prt.pdf>.

Standard independent assessment report template, parts 1 and 2. Available at <http://unfccc.int/kyoto_protocol/registry_systems/independent_assessment_reports/items/4061.php>.

B. Additional information provided by Portugal

Responses to questions during the review were received from Ms. Teresa Costa Pereira (Department of Climate Change, Portuguese Environment Agency), including additional material on the methodology and assumptions used.

Annex III

Acronyms and abbreviations

AD	activity data
APA	*Agência Portuguesa do Ambiente* (Portuguese Environmental Agency)
CH_4	methane
CMP	Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol
CO_2	carbon dioxide
CO_2 eq	carbon dioxide equivalent
CORINAIR	core inventory of air emissions
CRF	common reporting format
DGEG	*Direção-Geral de Energia e Geologia* (General Directorate for Energy and Geology)
EF	emission factor
ERT	expert review team
EU ETS	European Union Emissions Trading System
FOD	first-order decay
GHG	greenhouse gas; unless indicated otherwise, GHG emissions are the sum of CO_2, CH_4, N_2O, HFCs, PFCs and SF_6 without GHG emissions and removals from LULUCF
GJ	gigajoule (1 GJ = 10^9 joule)
HFCs	hydrofluorocarbons
IE	included elsewhere
IEA	International Energy Agency
IEF	implied emission factor
INE	*Instituto Nacional de Estatística* (National Statistics Institute)
IPCC	Intergovernmental Panel on Climate Change
ITL	international transaction log
k	waste generation rate constant
kg	kilogram (1 kg = 1,000 grams)
KP-LULUCF	land use, land-use change and forestry emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol
LPG	liquefied petroleum gas
LPS	large point sources
LUCAS	Land Use/Cover Area frame statistical Survey
LULUCF	land use, land-use change and forestry
MAI	mean annual increment
m^3	cubic metre
MSW	municipal solid waste
Mt	million tonnes
N	nitrogen
N_2O	nitrous oxide
NA	not applicable
NCV	net calorific value
NE	not estimated
NFI	national forest inventory
NIR	national inventory report
NMVOC	non-methane volatile organic compounds
NO	not occurring
PFCs	perfluorocarbons
PJ	petajoule (1 PJ = 10^{15} joule)
QA/QC	quality assurance/quality control

RMU	removal unit
SEF	standard electronic format
SF_6	sulphur hexafluoride
SIAR	standard independent assessment report
TJ	terajoule (1 TJ = 10^{12} joule)
toe	tonnes of oil equivalent
UNFCCC	United Nations Framework Convention on Climate Change